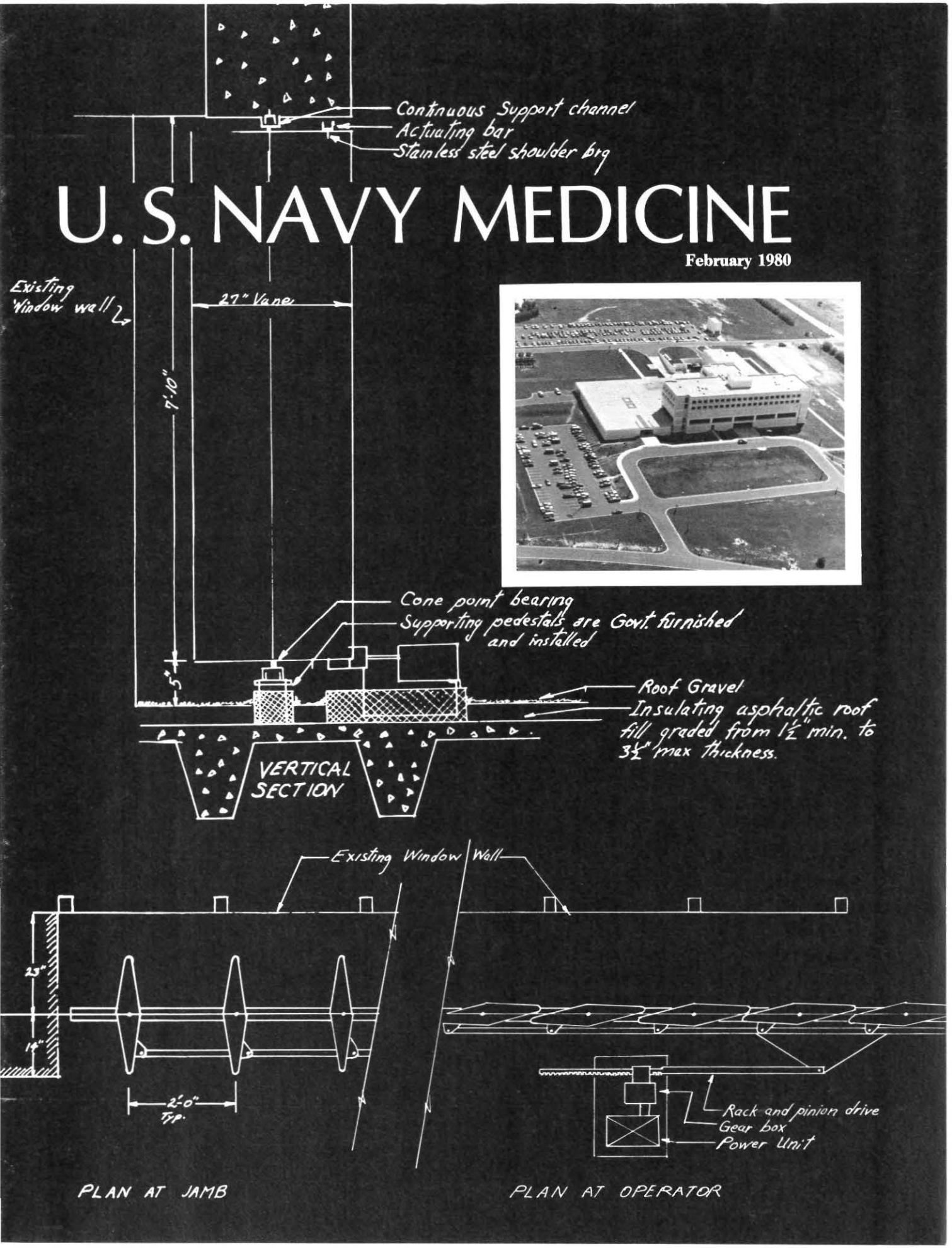

U.S. NAVY MEDICINE

February 1980

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CORRESPONDENCE: All correspondence should be addressed to: Editor *U.S. Navy Medicine*, Department of the Navy, Bureau of Medicine and Surgery (MED 001D), Washington, D.C. 20372. Telephone: (Area Code 202) 254-4253, 254-4316, 254-4214; Autovon 294-4253, 294-4316, 294-4214. Contributions from the field are welcome and will be published as space permits, subject to editing and possible abridgment.

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NAVMED P-5088

U.S. NAVY MEDICINE

Vol. 71, No. 2
February 1980

COVER: Engineer's print of adjustable, vertical louvers at NRMC Corpus Christi, Tex. This and many other innovations have made the facility a leader in Navy energy conservation. Story on page 20.

"Clearing the Air"

Some of you may have had the opportunity to review the recent report of Dr. Julius B. Richmond, Assistant Secretary for Health and Surgeon General of the United States on "Smoking and Health." A subsequent report on "The Health Consequences of Smoking for Women" will be generally available in the near future. The latter provides some unexpected insights on smoking and the associated increase in lung cancer and pulmonary disease among women in the United States. After reviewing these documents, it will come as no surprise to you that Dr. Richmond in a separate report from the Task Force on Disease Prevention and Health Promotion has identified smoking as the "first ranking public health problem in the United States today."

Smoking is no less of a problem in the Navy. One recent survey of incoming Navy and Marine Corps recruits suggests that up to 67 percent are current smokers. This level is far above that seen in similar age groups in the civilian community where an average of 40 percent of the men and 33 percent of the women smoke. Preliminary calculations suggest that the Navy Medical Department may expend close to $4 million annually for the care of active duty inpatients with diseases *directly* related to smoking. This figure does not take into account the additional costs for the administration of medical boards and discharges, the lost man-days due to hospitalization and convalescent leave, and manpower replacement. Further, the costs for treatment of diseases such as cancer of the urinary bladder, retarded fetal growth, and burns with which smoking is less directly associated have not been calculated. Neither have we clearly defined the impact on our beneficiary population of smoking as it reacts synergistically with alcohol in the evolution of cancers of the larynx, oral cavity, and esophagus; with mineral and vegetable dusts, irritant gases and fumes, and ionizing radiation in the etiology of acute and chronic pulmonary disease and neoplasia; with oral contraceptives in the development of thromboembolic disease.

Most of you are well aware of my personal and professional stand on smoking, and are familiar with BUMED Instruction 6200.1 which delineates our policy on smoking in BUMED Command Activities. In my communication with commanding officers and Navy Medical Department personnel, I have urged that we act together as exemplars in smoking modification efforts. My staff at BUMED has cooperated closely with the efforts of the National Cancer Institute Office of Cancer Communications, the American Cancer Society, and the National Interagency Council on Smoking and Health to assure that information on smoking modification is made available to physicians and to other members of the Medical Department. Indeed, the Navy Medical Department was among the first organizations to give broad support to the National Cancer Institute's "Help Smokers Quit Kit" campaign. With further support of the American Cancer Society we have initiated a series of workshops for training our own facilitators in methods for conducting smoking modification clinics. Although these efforts are continuing, thus far we have had only fragmented programs to assure that Navy Department personnel and their dependents who desire help can find it in our system. I recognize, as do you, that any successful community health promotion effort depends upon the community itself: the individuals, the commands, and the official and unofficial organizations. The initiation and motivation for health promotion programs, however, must come from health care professionals. I believe that the time has come for each of us to stand up and be counted. Accordingly, I am directing an expanded Navy Medical Department initiative aimed at reducing the impact of smoking related diseases on our beneficiary population and at providing help, information, and training to those who desire it. I have designated this effort as the "Navy Clearing the Air Program (NCAP)." Our message to the communities who rely on us for prudent judgment on health issues will be simple:

- If you don't smoke, don't start—here are the reasons.
- If you do smoke, stop smoking or at least try—we can help.
- If you can't stop, smoke less and switch to a lower tar/nicotine brand—here's how.

Over the next months you will be seeing an expanding initiative in the NCAP program. We expect to have the continued support of the National Cancer Institute, American Lung Association, and American Cancer Society in this effort. We have a very real opportunity at this time to assume a leadership role in smoking education and modification not only within the Navy, but also within the Department of Defense and perhaps in the nation as a whole. I know that I can rely on all Medical Department personnel to do their part as exemplars and leaders in improving the health of our Navy.

W.P. ARENTZEN
Vice Admiral, Medical Corps
United States Navy

Sailor is Half Marine

Jon Crowder joined the Navy with a desire to work with modern medical equipment inside an air-conditioned hospital. Instead, he runs up hills and rappels from helicopters into sweltering tropical rain forests. His medical equipment may include splints made from bamboo sticks and bandages made from scraps of uniforms. They call him "Doc." His job is saving the lives of combat Marines.

The 23-year-old native of North Little Rock, Ark., is a Navy hospital corpsman third class. He is presently serving on board the general purpose assault ship USS *Tarawa*, with Marines from the Second Battalion, Third Marines, Marine Corps Air Station, Kaneohe, Hawaii. This unit is part of a combat-ready group which could be one of the first units called in a Pacific crisis.

HM3 Crowder received orders for duty with the Marines after completion of Navy hospital corpsman school in San Diego. "My first thought was, 'Why are they doing this to me? I joined the Navy, not the Marines.'" But realizing the importance of the job and that someone had to do it, Crowder said, "I have been trained for the job. I don't see why that someone shouldn't be me."

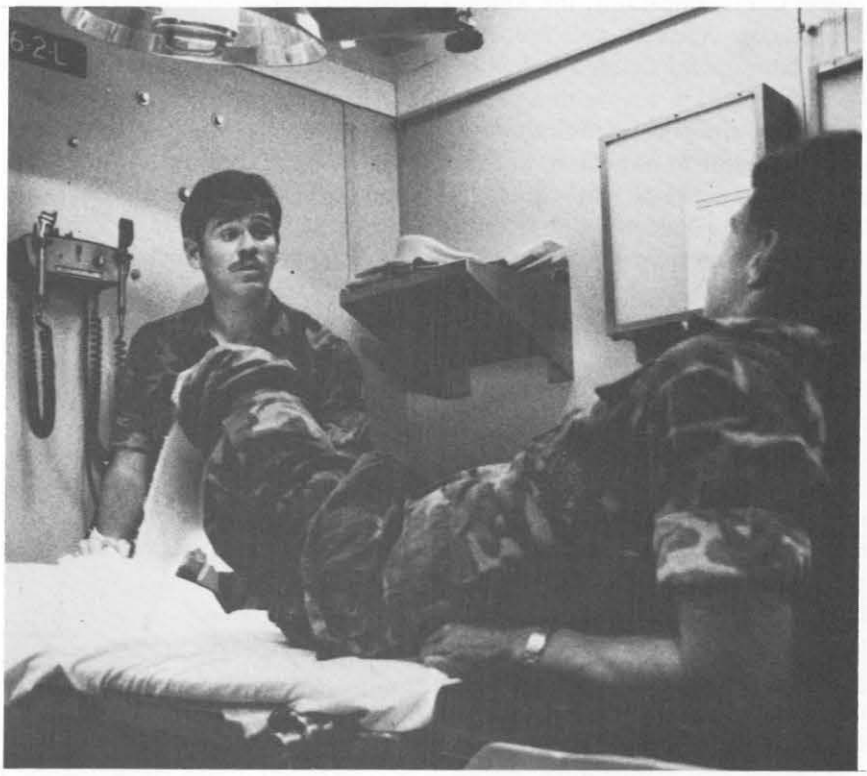
The 1974 graduate of Sylvan Hills High School, North Little Rock, joined the service because he believes everyone owes a little time to one of the services. He picked the Navy for two reasons. He had two brothers in the Navy and felt the Navy had the best medical program of all services.

"My brother James, a boatswain's mate first class, is also a Navy recruiter. He gave me all the information about what Navy school had to offer long before I ever joined," said Crowder.

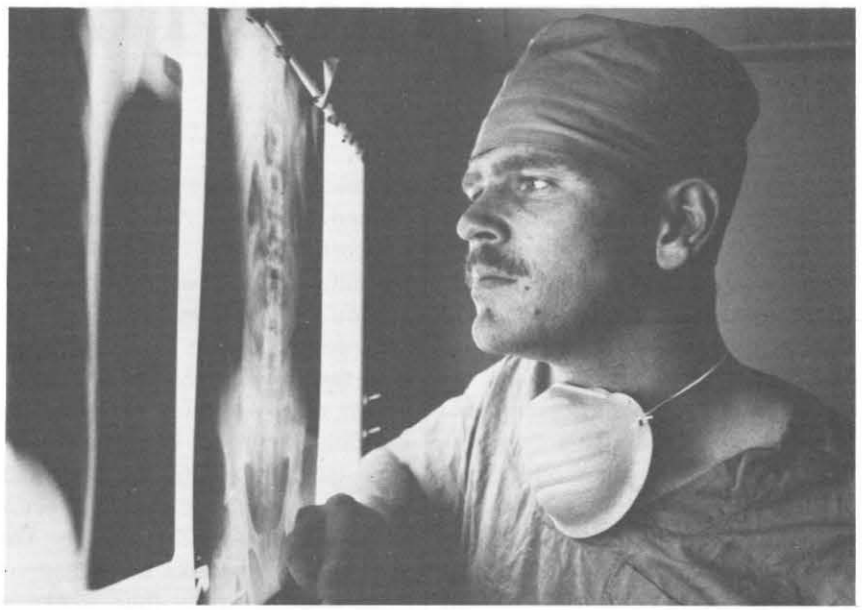
The term "Corpsman" is very special to him. "In battle, the corpsman is out there saving lives," and that, he says, is his ultimate goal.

Crowder describes his job as similar to that of a registered nurse. "In the field, until we can get a man to a doctor, we are the doctors. We are authorized to give shots, start intravenous injections (IVs), and give any treatment we think necessary to sustain life."

When deployed on board Seventh



HM3 Crowder treats a patient for a leg injury aboard Tarawa.



Clad in surgical greens, HM3 Crowder examines an x-ray in one of Tarawa's four operating rooms.

Fleet ships, Crowder participates in exercises so realistic, he says, "The only difference is there are no bullet or shrapnel wounds." Crowder just finished participating in one such exercise—Fortress Gale. An armada of more than 20 ships, 280 combat aircraft, and 40,000 Seventh Fleet Navy and Marine Corps personnel participated in the large-scale amphibious landing exercise.

His job was twofold. He participated in the make-believe war situation and was responsible for treating Navy or Marine Corps personnel who might have been injured in the exercise.

But combat training is not HM3 Crowder's only mission. He has also been trained for what could be the aftermath of a natural disaster. In the Navy, providing assistance to the local population is called civic action. Crowder participated in a Navy civic action program in May in the simmering mountain jungle setting of Botalon, Zambales, Republic of the Philippines. There he was part of a team of four corpsmen and one doctor, who examined and treated more than 600 civilian patients in four days.

"I saw the people and I saw their need. That gave me the drive to keep going. We saw everything from untreated year-old staph infections to leprosy and tuberculosis," he said. "I felt good knowing I was helping those people."

—Story and photos by PH1 Bob Weissleder, USN

Summer's Coming (and so is ACDUTRA)

This article has been written primarily for students in the Armed Forces Health Professions Scholarship Program (AFHPSP), but much of the information concerning travel and per diem applies to all Navy students on funded active duty for training (ACDUTRA) orders. We hope, through this article, to offer you some insight into ACDUTRA travel and monetary policies, although we realize we cannot address all situations you may run into while on ACDUTRA. Remember, the monetary amounts we cite are approximate, and travel regulations continually change. Any conflict between the information in this article and local command payment policies is resolved by the command's policies.

Students in the Armed Forces Health Professions Scholarship Program must perform 45 days' ACDUTRA in paygrade 0-1 each year. ACDUTRA involves budgetary funding and is partially controlled by the federal fiscal year (1 Oct-30 Sept). You may not receive more than one ACDUTRA period during one fiscal year.

After you receive your ACDUTRA orders, follow all directions carefully. You must report to the address (or addresses) shown on or before the specified times and dates. Your 45 days of ACDUTRA includes travel time. Authorized travel time may not exceed 24 hours at the beginning and at the end of the ACDUTRA period. If you live farther than normal commuting distance from your ACDUTRA duty station, the day before your reporting date is counted as a day of travel, as is the day of detachment. If you receive orders to a duty station that is more than one day's driving distance from where you live, you should use commercial air transportation unless you wish to travel on your own time. If you do elect to travel on your own time, you are not considered to be on active duty more than 24 hours before the reporting time specified in your orders and 24 hours after the time you are detached. Thus you are not protected under active duty medical, death, or insurance benefits.

If you are reporting to Officer Indoctrination School in Newport, you will not be able to travel on your own time since you will be ordered to an intermediate command—as explained later in this article.

Your ACDUTRA orders will cite the amount of money set aside for pay, travel, per diem, and uniform allowances. While you are performing ACDUTRA, you receive your pay by check from the disbursing office nearest your ACDUTRA station. Your stipend from NFC, Cleveland, is stopped during your ACDUTRA period. The amounts shown for travel and per diem are maximum estimates. You will only be reimbursed for whatever amounts are supported by the travel claim you submit when you report to your duty station. This reimbursement will vary depending on how you travel, how far you travel, and the availability of government messing and berthing facilities. If bachelor officers' quarters (BOQ) are available, you must either use them or secure lodging at your own expense. You are expected to make BOQ reservations approximately four weeks in advance, by writing to the BOQ officer of the command to which you are ordered.

The amount for pay cited in your orders includes basic allowance for quarters (BAQ) and subsistence. BAQ at the 0-1 level is $219 a month for married officers, and $168 a month for single officers. Subsistence amounts to $67.21 a month for all personnel. Single officers lose their basic allowance for quarters if they reside in the BOQ, but they still receive a "partial rate" of $13.20 per month. Married officers do not lose their basic allowance if they reside in the BOQ.

The following information should help you plan your expenses:

- If you travel by private automobile you will receive 7 cents per mile if you also receive per diem. But you will receive per diem only if no government quarters and/or no

government messing is available. You will receive 10 cents per mile if both government quarters and messing are available. Travel miles are based on official government distance tables. There is no reimbursement for meals when you travel by private automobile.

- If you travel by commercial transportation, save all air, train, bus, and taxi receipts to support your claim. An allowance will be paid for the meals you take while you are traveling commercially. There's no need to save meal receipts.
- If both government messing and berthing are available, you will receive no per diem reimbursement, even though there will be a daily BOQ service charge at most duty stations. The BOQ service charge varies since it is set by each command. It has been known to range from $1.50 to $2.50 a day, but could go higher.
- Government messing and berthing are always available for students at OIS, and at this command only, there is no BOQ service charge. If you are not drawing per diem, Navy-wide government messing will cost about $1.05 for breakfast, $1.75 for the noon meal, and $1.75 for the evening meal. Meal rates are higher if you are drawing per diem.
- You must reside in the BOQ if space is available. However, if neither government berthing nor messing is available, you will receive approximately $16 a day for meals. Be sure to save your itemized lodging receipts. Per diem reimbursement for meals and lodging together usually cannot exceed $35, although in a few designated areas the amount is higher. In the Washington, D.C. area, for example, the limit is $50.
- If government messing but not berthing is available, you will usually receive $9.85 a day plus the average cost of your lodging.
- If government berthing but not messing is available, you will receive approximately $16 a day for meals. Also, in this situation only, you will be reimbursed for BOQ service charges.
- If you are ordered to a duty station within commuting distance from your home, you will receive no travel allowance and no per diem.
- The time at which you are paid your travel allowance and per diem will vary from one duty station to another. While travel will probably not be paid until you return home, a portion of per diem is sometimes advanced when you report aboard, especially if you must secure commercial lodging. The initial uniform allowance is paid within two or three weeks after you report to OIS at Newport, but not until well after you complete ACDUTRA at any other duty station.

If you are ordered to OIS and live so far away that you cannot travel there by private conveyance within 24 hours, travel by commercial air transportation will be necessary. You are cautioned against trying to drive excessively long distances that could jeopardize your safe, punctual arrival.

Before you report to Newport you must first be ordered to a naval reserve center near your home for three days, since the Newport training lasts only 40 days and school officials will not allow early reporting. You must physically report to and leave from this "intermediate" naval reserve center duty station at the time and date stated in your orders. Officials at the center will endorse your orders when you arrive and when you depart. Because of this policy, many of you will find there is no way you can travel to Newport on your own time, and you will have to use commercial air travel.

While on ACDUTRA you are entitled to active-duty medical benefits and to Servicemen's Group Life Insurance (SGLI) of $20,000, for which $3 a month will be automatically deducted from your ACDUTRA pay along with federal income tax and FICA (Social Security) withholding.

The medical benefits have broad implications. One of the benefits concerns dependent care under the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS). You should be aware that the Naval Health Sciences Education and Training Command will not force ACDUTRA orders to coincide with elective or planned hospitalization of dependents—including maternity care benefits under CHAMPUS.

ACDUTRA is assigned during summer break periods whenever possible. You will receive your orders approximately 30 to 60 days before your reporting date. To be on the safe side, don't make any plans for your vacation months until you have the exact dates of your active duty for training.

The Space Shuttle and the Future: Conclusion of an Interview with Dr. Kerwin

In the January issue, U.S. NAVY MEDICINE ran part II of an interview with NASA Scientist-Astronaut CAPT J.P. Kerwin, MC, USN. In this month's concluding segment, Dr. Kerwin discusses the next step in America's space program and what we can expect for the future.

I understand that you are very involved on the Space Shuttle project. Exactly what are you working on?

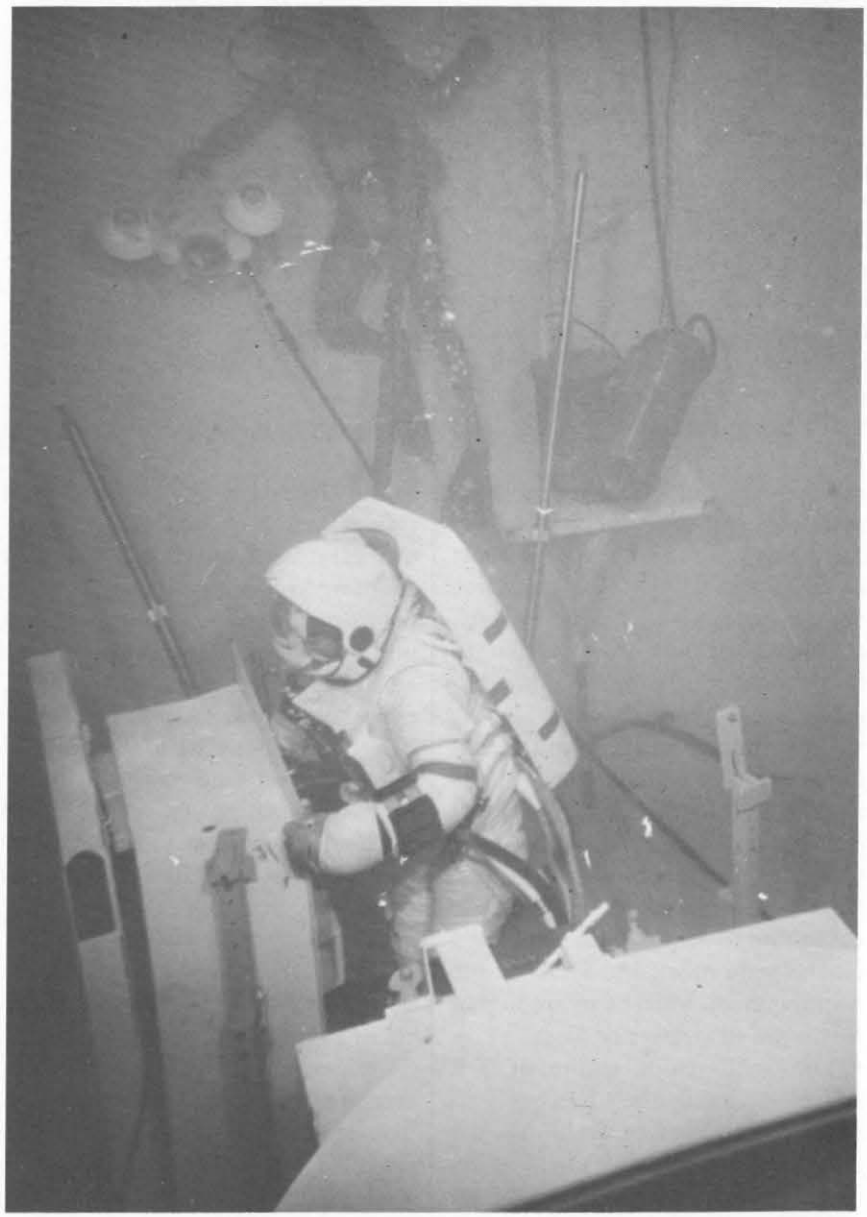
We are working on an interesting problem with the Shuttle. How do you go EVA without getting the bends? We have a different vehicle with a different atmosphere and a potentially serious bends problem.

What's the atmosphere in the Shuttle?

It's sea level air. In Skylab we flew one-third of an atmosphere—70 percent oxygen and 30 percent nitrogen. The pressure was low and you could put your suit on and go out without even worrying about it. In the Shuttle that's not true. It's like popping from sea level up to 30,000 feet just like that when you go outside. We have to develop procedures to wash the nitrogen from the system or possibly reduce the pressure of the whole vehicle for several hours before a planned EVA to allow the crew to get the nitrogen out of their blood and joints.

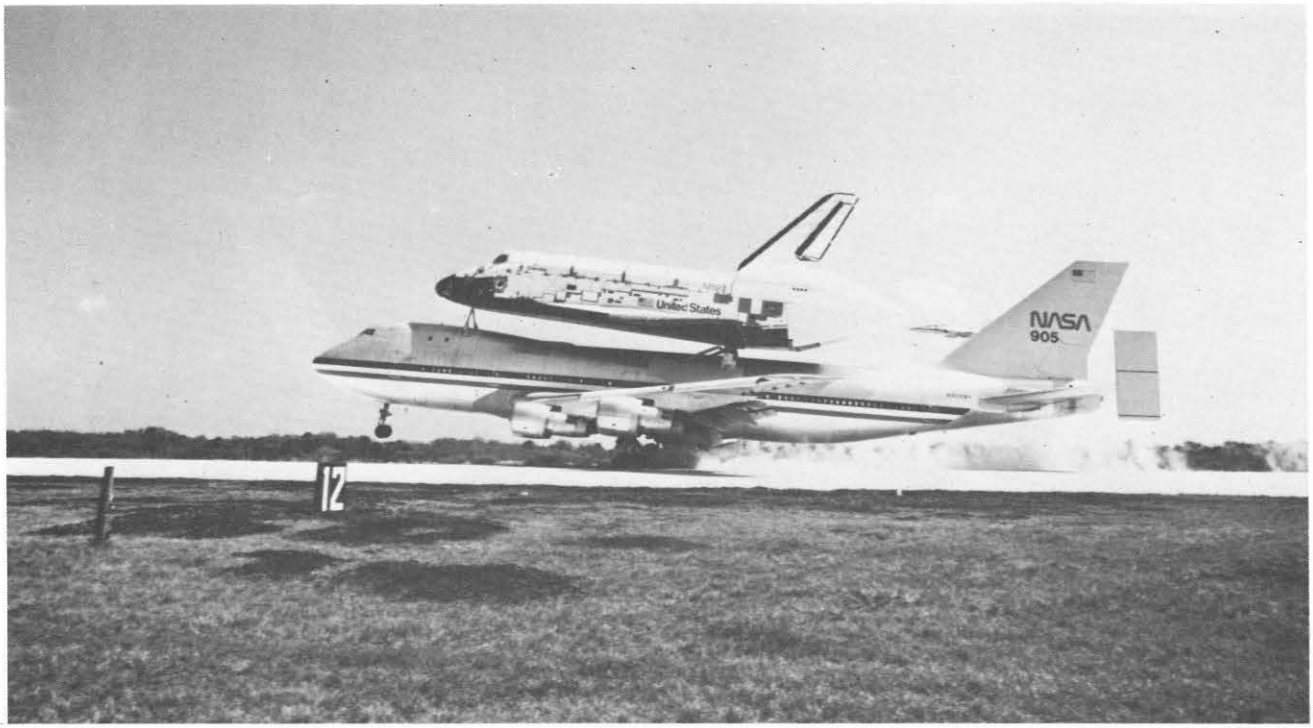
What else have you been involved with on the Space Shuttle program?

One of the nice things about being on Skylab is that until we get more flights under our belts, we are



NASA photo

Dr. Kerwin works on an early developmental model of the "cherry picker" or manned remote work station in the water immersion facility at the Johnson Space Center. Such an environment gives almost the same sensation as an extravehicular activity at zero gravity. The manned remote work station will be used aboard the Shuttle.



NASA photo

The Space Shuttle Columbia arrives piggyback aboard a 747 at the Kennedy Space Center last March.

the latest guys that have flight experience. Inhabitability, sleep station design, EVA procedures, controls and displays, computer techniques, etc. are some of the areas in Shuttle design and operation where we can be of help.

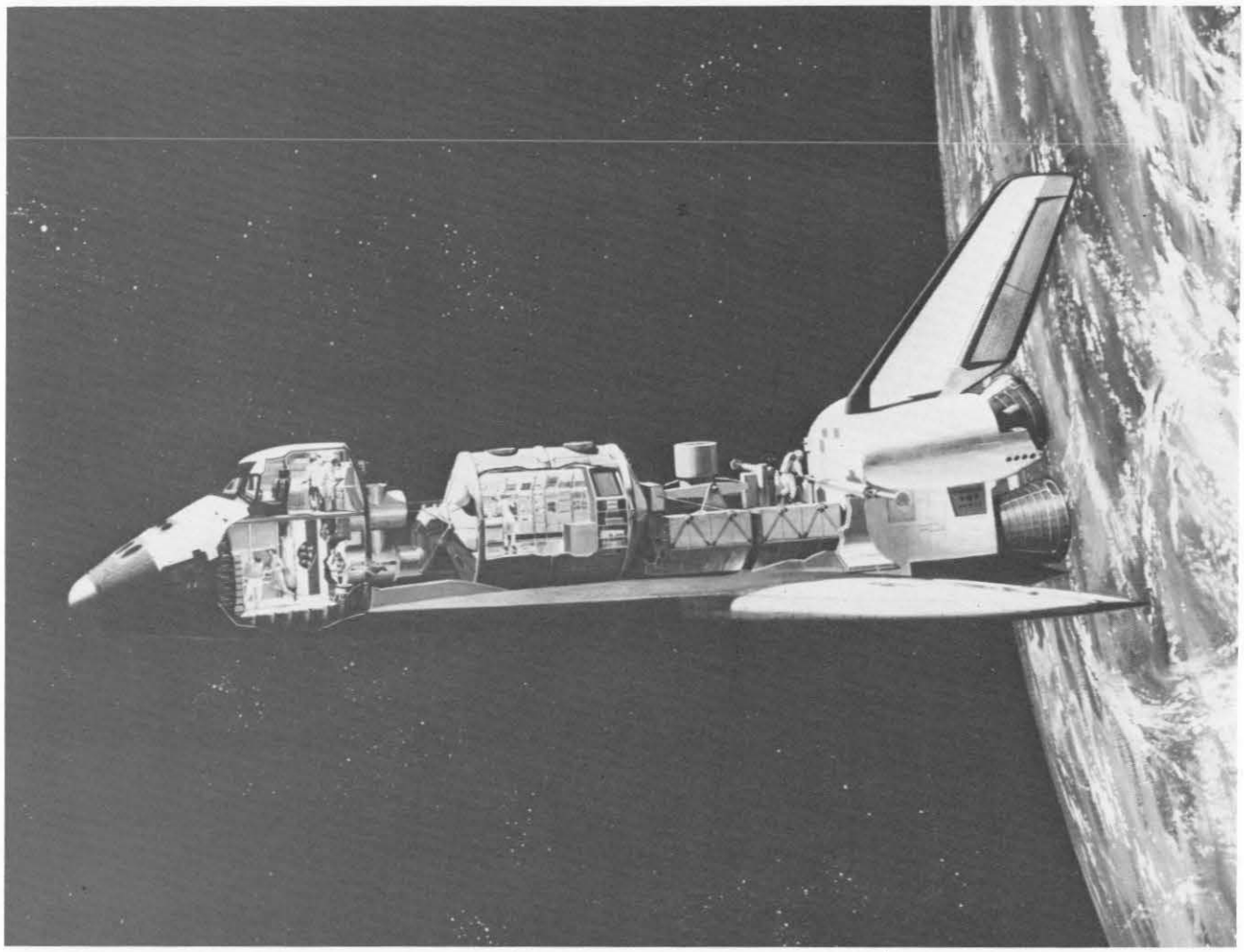
Our particular job right now is not to work on the Shuttle systems themselves. We have another large group getting ready for the first flight. Our job is to work with all the payloads, all the things the Shuttle will carry up with it once we get the test program over with and to work with those designers to make the thing operable. Synchronous orbit satellites are some of the items we're working with. We will carry the upper stage rocket with the attached satellite in the payload bay. The Shuttle will go into lower Earth orbit, deploy the satellite and booster, and then back away and let it fire the satellite into a higher synchronous orbit.

We also have attached payloads; some are man-operated, some are not. We'll have flights of seven to ten days duration doing medical experiments, scientists doing astronomy and atmospheric physics, etc. The design of the instruments with the capabilities of the Shuttle in mind, putting together flight plans and check lists, the design of software and hardware interfaces with the crew—all need crew input.

So, that's what we're doing. We have a list of 30 or 40 payloads to work with.

Then, there are the medically involved problems—motion sickness, the problem of acceleration on reentry, and the bends problem I've already mentioned. These are the only three medical problems we have right now. The bends is a matter of the Shuttle being a sea level air vehicle and EVA being a suit environment of 4 psi instead of 14.7 psi.

The problem of motion sickness, which is not a serious one for long duration flights, is a serious efficiency problem for short duration flights. If you fly with a crew of six and you have 50 experiments and seven days to do them in, it means everyone's got to hit the deck running when you get to orbit and work like hell for a week to get that flight accomplished. If half the crew is seasick and begins to feel better at day five, you've got a serious problem. It's expensive to operate like that. We are working to try to solve motion sickness in three ways. How, for example, do you predict from some kind of test you can do on the ground who's going to get sick? We can't do that yet. We just don't know enough. The correlation in past flights between guys with good tolerance to motion sickness in airplanes, boats, cars, and rotating chairs has not been good. The most lead-headed crewmen have gotten



NASA photo

A key Shuttle payload in Spacelab (center), a multipurpose laboratory that will enable scientists to conduct experiments in the gravity-free environment of space.

sick in space. We're devising batteries of tests to try and find one that will predict accurately.

The second thing is to habituate. Once you find out who is susceptible, perhaps you design some exercises or evolutions for them to go through on the ground, whether it be aerobatics in an airplane, some form of SCUBA diving, three-dimensional rotators, take them to the amusement park and put them through all the rides, or something that will make them more resistant to motion sickness.

The third thing is to develop better drugs to prevent the symptoms from incapacitating them in orbit.

Have you come up with such a drug?

Yes, and it's still the best drug there is for motion sickness and it was invented by the Navy. It's a combination of two relatively common drugs—Scopolomine and Dextroamphetamine. When Dr. Graybiel [Ashton Graybiel of the Naval Aerospace Medical Research Laboratory] worked on this problem 10 years ago, his researchers did an exhaustive review of the literature and they noticed that way back around WWI, when there had been a great deal of work done on seasickness, an investigator had reported that Scopolomine appeared to be effective. Somehow it had gotten lost. They began doing tests at Pensacola using Scopolomine and found that it was effective but made people drowsy. What would counteract the drowsiness? Amphetamine was the logical choice. They tried Dexedrine and found, much to their surprise, that it potentiated the motion sickness preventing effect of Scopolomine. The two drugs together were more than twice as good as either one alone.

And it makes sense. You have a sympathomimetic drug and a parasympatholytic drug operating together suppressing what must be parasympathetic mediated vomiting effects from the stimulus. Scopedex is, therefore, our first line drug.

Is it on the market under another name?

No. Both drugs, particularly Dexedrine, are subject to abuse and most drug companies are very hesitant to market it for this indication.

We're looking at better ways of administering it because one of the problems with orally administered drugs for motion sickness is that if you begin to get symptoms, your gastric motility ceases and the absorption of the drug will be very poor. You will eventually vomit most of it back up. Therefore, you must take it as a preventive and Dr. Graybiel is now looking at skin patches impregnated with Scopolomine and a vehicle, probably DMSO, for transdermal absorption of the drug—very steady, very low blood levels but insensitive to the effects of gastric absorption.

You said that susceptibility to motion sickness generally becomes less as flight duration increases. Is there any fear that an astronaut will become motion sick during an EVA?

Yes. In fact on Apollo 9 we had the first serious case of motion sickness. Rusty [Russell L.] Schweikart was quite severely hampered by motion sickness. There was very serious concern. He was due to go EVA on day five and they nearly cancelled it because they thought of the danger of his throwing up in the suit. It could coat his visor and he might end up aspirating it and really get into trouble. Fortunately, he was feeling better by day five and they went ahead with the EVA.

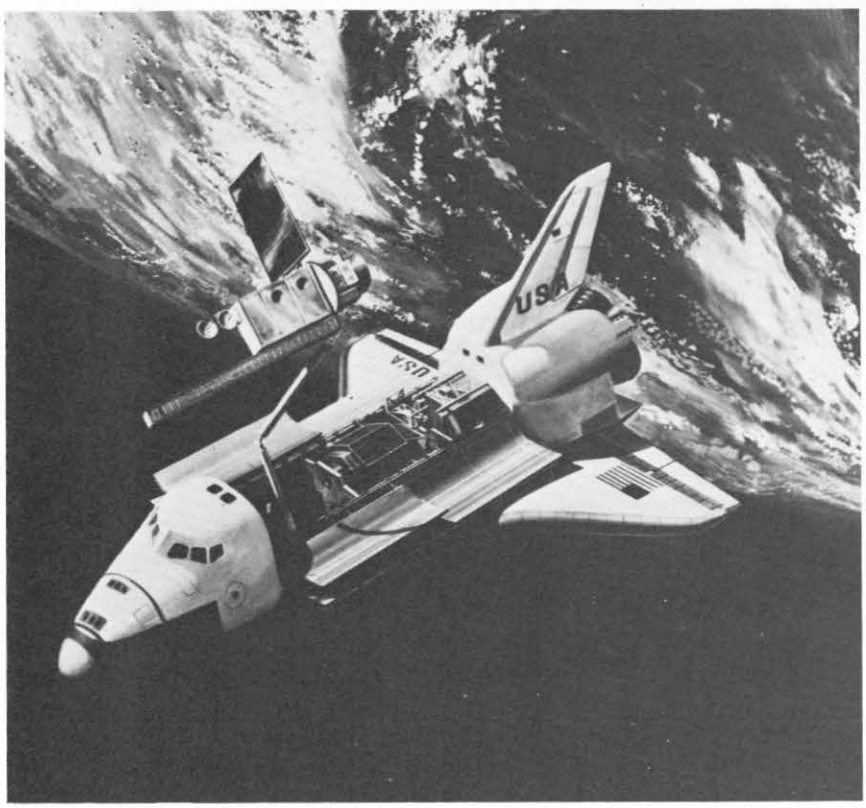
So, essentially, there's really little defense against the possibility of motion sickness on an EVA.

That's right. If you have to go EVA on the first or second day of the mission that's something you have to think about. You really like to have at least one crewman who is a known insusceptible.

What other medical problems do you have to look forward to on the Space Shuttle project?

One short-term clinical problem is the problem of blackout. Will the pilot blackout upon reentry? You look at the G profile and wonder how anyone could blackout. They're only pulling two Gs. High performance fighters in dogfights and tight turns can pull five, six, and seven Gs for short periods of time with G suits. But the difference is, we will be going into space for a week to a month and we will lose blood, the cardiovascular reflexes are down, plasma volume is down. We will be intolerant to gravity when we return from space. This reentry G, which is very gentle, is also of long duration. It's not like the average turn in a fighter which is 30 seconds to a minute. Shuttle reentry is about a 25-minute profile and the Gs last a long time. You don't want the pilot blacking out while he's manually flying this 1 billion dollar machine down to the runway. We are going to give the Shuttle crews G suits and we're in a bit of a controversy now as to how they will use them. Do they prophylactically inflate them every time they reenter before the onset of Gs or do they wait until they feel the suits are necessary? I suspect that on the short flights the crews won't need the G suits at all, but on longer flights they will.

NASA photo



The Shuttle will place Earth satellites into orbit and retrieve them for refurbishment and reuse.

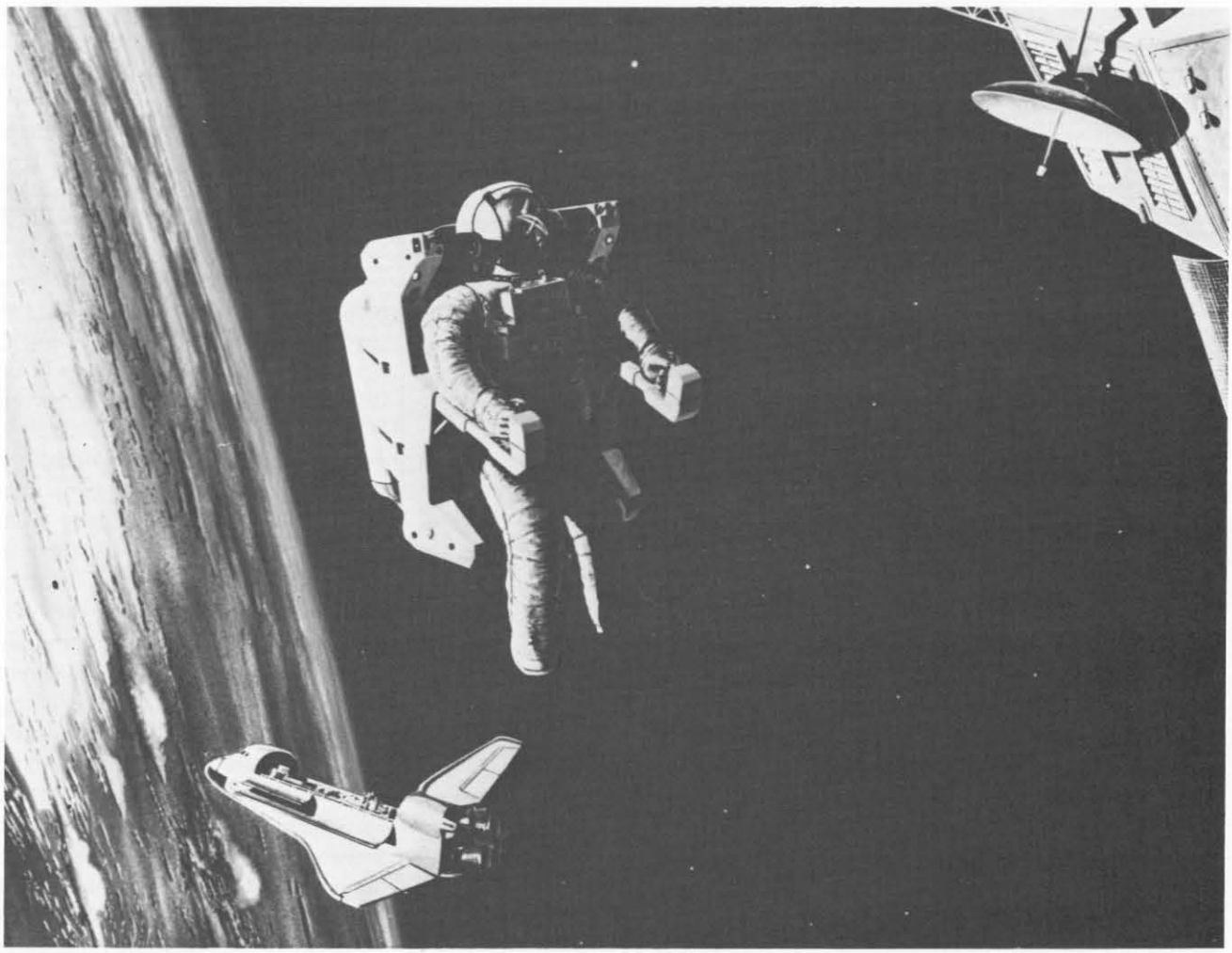
The big event last summer was the death of Skylab. When it finally plunged back to Earth, what were your feelings?

Relief. It would have been nice to have gotten a piece of it as a souvenir but what the heck. We didn't design Skylab as a permanent vehicle. It was designed as a test bed for space station concepts. It was designed for a one-year lifetime. The fact that it was still alive and commandable after six years was remarkable and surprising, particularly in view of all the problems we had with it the first week. We weren't sure it would last the month and here it was six years later still waking up and answering commands. I don't think it was a useful vehicle to us anymore had we been able to keep it up. It was just a great, big piece of junk. There are some people who won't agree but that's my opinion.

So we felt no emotional sorrow to see it go. We felt a great deal of apprehension that it would hit someone. We did, in fact, have a plan to go with the Shuttle and reboost it to a higher orbit. We were the victims of our own miscalculations.

The space program is still pretty new and our precise mathematical figures on the effects of drag on spacecraft at very high altitudes were off. We estimated a lifetime for Skylab until 1983 and it turned out to be 1979 instead. The orbit simply decayed sooner than we calculated.

The other miscalculation we made was how active the Sun was going to be in the next solar cycle. As it turns out, the Sun goes through these 11-year cycles and when solar activity increases, particles of radiation from the Sun hit the atmosphere and heat it, causing it to expand. This causes the density at very high altitudes to increase. Therefore, the



NASA photo

An artist's concept of a Shuttle crewmember equipped with a manned maneuvering unit as he approaches a satellite for inspection.

NASA photo

After an almost 30-minute reentry glide from orbit, the Shuttle will come in for a dead-stick landing.

more solar activity you get, the more drag you have on spacecraft in high orbits. We had a solar cycle that started out like gangbusters and was quite a bit higher than the average cycle on which we based our calculations.

We are also a year or more late in getting the Shuttle airborne. We did have a plan back in 1973 to go and reboost Skylab at that time. It was rather hastily thought out, would have been expensive, and would have meant another manned launch with a specially modified command module. The Administrator met with the forecasters and questioned the need for such a mission. They told him that Skylab would be pretty much in the same orbit in 1983, the Shuttle would be ready in 1979, and even if those calculations were wrong and Skylab did reenter early, the chances of it hitting anyone were very, very low. He decided to save 300 million dollars and take his chances. That decision, I'm sure, gave him some sleepless nights last spring, although that last prediction, fortunately, turned out to be true.

They tell me you're a great fan of science fiction and that you took a few books up with you for relaxation.

Yes, we had some books. One of the fun things we brought back was a photo of one of the rooms in the Skylab in which strapped to the wall was a copy of a Ray Bradbury novel. A few months ago we presented Ray with a copy of that picture showing that he had been read in space.

Are you going to get another chance to fly and if so will it be on a Space Shuttle mission?

The answer to the first part of that question is yes, and to the second, most probably. The delays in the program are not that helpful to us older guys. We should have launched the first Shuttle by now and it's still probably a year away, but we are really looking forward to it. —JKH

The Challenge of Aviation Medicine

The following is an address by VADM Willard P. Arentzen, MC, USN, Surgeon General of the Navy made at the Naval Aerospace Medical Institute, Pensacola, Fla., at commencement exercises on 20 Dec 1979.

It is my great pleasure to join you in recognizing this occasion as a landmark in the accomplishment of the primary goal of the Navy Medical Department—to provide the highest quality comprehensive and effective health care to the men and women of the Fleet and Fleet Marine Force and their families. Naval Flight Surgeon Class 79-3 is the largest in over five years. It is, also, a personal privilege to share with you, the graduates, this significant day in your professional careers. With today's commencement exercise you enter the most exciting, challenging arena available in the field of medicine anywhere in the world.

You leave the confines of the medical institution to bring your personal and professional presence to bear on those who must serve in the often uncertain and unpredictable environments in which we all too often find our naval forces. You will soon learn, as have those who have gone before you, that with your newly acquired status comes the responsibility to meet a broad array of expectations. You are the primary care, specialty consultant and referral expert all in one. You will be expected to exercise basic medical skills and utilize your newly acquired special knowledge under every conceivable circumstance. And, you will through necessity, innovate and extrapolate to fulfill your mission. Over 500 of our active duty career Navy medical officers and 500 hospital corpsmen have preceded you. Their success in peacetime and time of conflict bear out my confidence that you will all meet with the utmost success.

On today's seemingly ever shrinking globe, international tension is accepted as a norm rather than the exception. The value of a strong naval force in providing the traditional benefits of protection of our vital sea lanes of communication and supply, and projecting America's interest in strengthening the ties of freedom and democracy, becomes apparent to us all. The world recognizes the U.S. Navy as the most formidable in existence. The margin we currently enjoy, has its roots here—in Pensacola—in naval aviation. It is our mobile, multi-capable carrier force, technologically superior antisubmarine warfare arm, and airborne, air-supported amphibious striking element that provide us with this advantage.

During the past 75 years, American "know how" and the Navy's "can do" spirit have provided the technological and scientific advances, special adaptations, and foresight necessary to enable our development of these defense assets. But, one element must not be overlooked. The common denominator in our equation for success is *not* the ever changing weapons platform, or the dynamic systems involved, but the human resource—that all important, critical element—man.

Against this background then, we address you, the aviation medicine team. Your collective expertise, reflecting individual training and professional knowledge in clinical medicine, physiological limitations, psychological factors, environmental stress, epidemiological techniques, and occupational hazards is critical to the selection, training, preparation, and maintenance of all personnel involved in aviation. The success of your efforts bears heavily upon the ultimate readiness posture of every aviation unit of the fleet.

It may surprise some of you to learn that Navy medicine first became involved in naval aviation as early as 1912 with the Bureau's development and promulgation of physical standards for aviation personnel. With the rapid advances in aircraft and air warfare over the next decade, which included our experiences in World War I, this new frontier appeared limitless. Perceiving the impending expansion and involvement of the Navy in this area, in 1921, the Bureau of Medicine and Surgery ordered the first five Navy medical officers to formal aviation medicine training.

In 1924, designation criteria were established for this new military medicine specialty and the naval flight surgeon assumed his place on the operational medicine team. In 1932, the first efforts in aeromedical research and development were begun. By 1939, the need for a dedicated facility as a seat of learning and repository for information and expertise in aviation medicine was apparent. From that early beginning as the School of Aviation Medicine, through the evolutionary changes that brought the inception of the Naval Aerospace Medical Institute in 1965, the leadership role in operational medicine education, training, and research, as well as direct specialized professional and technical consultation and support

to the fleet, provided by this institution has been clear and irrefutable. And, I might add in this regard, the continuing value of this facility to the naval establishment, and in particular, its contributions to the readiness of our operating forces, remains unquestionable. If you infer from the foregoing that I foresee a bright and productive future for this command and its efforts, you are, indeed, correct.

Aerospace medicine has come far, as have other areas of operational medicine. Upon our ability to involve every member of the Medical Department in direct medical support to the operating forces rests the very future of Navy medicine. We have placed great emphasis on career development including fleet tours for all. In the past two years alone, nearly 70 percent of our residency selections have been fleet experienced physicians. And, next year, 70 percent of our Navy interns will report to a wide variety of fleet billets. Your competitiveness, and that of your colleagues in the fleet, for career oriented, professionally enhancing training billets is clearly improved and emphasized by this program. But remember, this is only the first step in providing a multi-capable, broadly experienced cadre of professionals. It is our intention to continue to develop and expand this concept. Every Navy Medical Department member must have a contingency assignment as well as his traditional clinical duty, in which he is equally capable and competent to perform. There is already ample precedent for this, and you should be aware as you commence your careers in Navy medicine what the future portends. Currently 6 of our 26 medical center and hospital commanding officers are flight surgeons, all of whom have had tours of duty as senior medical officers on one of our aircraft carriers, as well as advanced clinical assignments en route to their present positions. Three of our medical flag officers are also flight surgeons, and two of them served as carrier senior medical officers as well. All are board certified medical specialists in their own right. The skills and knowledge you have acquired bring with them the responsibility for the health and welfare of those with whom you serve today. The experience you will soon gain vests in you a large share of the responsibility for leadership tomorrow.

You in the Aviation Medicine Technician Class have a proud tradition of service to the fleet. Since the first AVTs (aviation technicians) were trained here at the school during World War II, you have come to be recognized as being among the most valued specialized physician extenders in the Hospital Corps. Your duties will vary from field service with the Marine Amphibious Forces, to the challenging environment of search and rescue at sea. You bring with you the ability to protect and serve our most important asset, our people. Serve them well.

To you of the Medical Service Corps, your special attributes in understanding the physiological and psychological implications of man in flight have long been recognized, and formally so by the Navy for many years. Traditionally, you have been tasked in the highly technical areas of aircrew training and human factors research. However, the challenges of today's Navy have expanded your horizons. You are now expected to involve yourselves in direct fleet support through such innovations as the Aeromedical Safety Officer Program. Your adeptness in applying your skills to the fleet aviation environment is critical to our success in naval aviation safety. Your preparation has been thorough. Use it well.

The aviation medical officer evolved out of necessity in 1975. Although limited in your technical training, you bring to the aviation community the professional, clinical support required to maintain the health and welfare of our nondeployed forces. You are an integral part of our overall aviation medicine mission. Be attentive to your patients, and alert to the subtle signals so characteristic of them.

To the naval flight surgeon falls a formidable responsibility as leader of the aeromedical team. You are expected to be the specialty consultant in clinical aviation medicine, the expert in environmental and occupational medicine, the primary investigator in the epidemiological support of accident prevention and aviation safety, the professional advisor and personal confidant to the line commander, and the personal physician to the naval aviation officer, his aircraft and ground support crewmen, and their families. The list could go on and on. The question arises on occasion why we go to such lengths to train our flight surgeons in everything from cardiology to physiology, and even insist on basic naval flight training. The fact is we provide the most extensive and comprehensive basic course of instruction in aviation medicine in the entire world. The reason is clear and simple. The naval flight surgeon must be prepared to serve and function capably in the relative consultationless environment of the forward deployed forces of our Navy and Marine Corps. Your billet assignments are clear evidence of this.

For three of you, it will be the exciting new experience offered by the Naval Undersea Medical Institute and the unique duties that dual designation will bring. For three more, dual designation as naval aviator/flight surgeons will bring you to the fore in human factors and

bio-engineering research in the actual flight environment. Six of you will report to carrier air wings, where the unique challenge of aviation medicine at sea will be your experience. Thirteen of you will serve with the Fleet Marine Force. Nine of you will be in overseas billets. Sixty percent of you will serve with forward deploying units.

To the wives, loved ones, and friends I extend the appreciation of a grateful Navy for your sharing of these dedicated professionals. The Navy is, indeed, a family unto itself, one which you have joined along with these distinguished graduates. Your understanding and continuing support is a vital element in our ultimate success.

Yes, you the members of Aviation Medical Technician Class 80-01, aviation medical officer, aerospace physiologist, and Naval Flight Surgeon Classes 79-3 have worked hard and learned well. Your challenge is broad and encompasses all of naval aviation and Navy medicine. That you will successfully meet that challenge is implicit in your designation this morning.

I give to you the new, and all the members of the naval aviation medicine team, your traditional charge—"keep them flying—safely!"

The Family Physician and the Problem Drinker

It is estimated that one out of every 20 patients seen by the family physician is suffering from the adverse physical and emotional effects of alcohol abuse.(*1*) However, data suggest that only 1 in 10 alcoholics is diagnosed and treated as such.(*2*) It is believed that the diagnosis is often missed because most patients rarely complain about or wish to discuss their alcoholism. Instead, they present complaints relating to excessive anxiety and tension, gastrointestinal disturbances, sleep problems and other general physical or psychological symptoms.(*1*)

The increased emphasis on the disease concept of alcoholism has encouraged the physician to improve diagnostic and treatment skills in this area. This can best be initiated with the recognition by all professionals that alcohol is a widely abused *psychoactive drug* of the sedative/depressant class and that it is highly *addictive*, exhibiting all four parameters of drug dependence as defined by the World Health Organization: *psychic* dependence, *physical* dependence, development of *tolerance* and characteristic *abstinence* (withdrawal) *syndrome.*(*2*)

As alcoholism and alcohol-related disorders tend to follow the same pattern as other diseases—including onset, acute episodes, remission, relapse, deterioration and even death—the sooner diagnosis is made, the better the prognosis. Prompt identification is also important as alcoholics generally tend to misuse all medication in the same way that they abuse alcohol, often increasing dosages and refilling prescriptions given for the presenting complaints without their physician's knowledge.(*3*) It should also be noted that with continued drinking, an enzyme system—the microsomal ethanol oxidizing system (MEOS)—is induced, which is associated with a nonspecific enhancement of a wide variety of microsomal enzymes. This results in an altered metabolism of many commonly prescribed medicines, i.e., half-life may be markedly shortened in the absence of alcohol, whereas it may be prolonged when the same medication is taken in combination with alcohol.(*4*) Therefore, when use of any other psychoactive medication, i.e., sedatives, hypnotics and minor tranquilizers, is deemed necessary in these dependency-prone individuals, close supervision should be maintained.

No one is in a better position to detect the patient with alcohol problems than the family physician, and there are many physical and psychological manifestations of alcoholism that can be detected long before the appearance of such classic signs as red face, bloodshot eyes, shaky hands, enlarged liver or frank malnutrition.(*1*)

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Smoking and Health in the Navy

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Smoking and Disease

Cigarette smoking is the largest preventable cause of death in the United States today.(*1*) It has been identified as a causal factor for cancer of the lung, larynx, oral cavity and esophagus, coronary artery disease, peripheral vascular disease, chronic bronchitis and emphysema, and respiratory allergy.(*2*) Extensive studies have also associated it with cancer of the urinary bladder, peptic ulcer disease, retarded fetal growth, spontaneous abortion, and impaired growth and development in early childhood.(*2*) Cigarette smoking acts synergistically with alcohol to increase the risk of cancer of the larynx, oral cavity, and esophagus; with asbestos and other mineral dusts, cotton dust, chlorine gas, ionizing radiation, and rubber fumes to produce pulmonary damage and lung cancer; and with oral contraceptives to increase the risk of thromboembolic disease.(*1,2,3,4*) In addition, smoking is a contributing factor in deaths and injury from fires, burns, and automotive accidents.(*1,2*) Even nonsmokers who are passively exposed to tobacco smoke have altered carboxyhemoglobin levels and suffer from eye and respiratory membrane irritation.(*1*)

Some segments of our population are at special risk from cigarette smoking, especially individuals with hypertension and elevated cholesterol and persons with alpha-l-antitrypsin deficiencies. Others at special risk include pregnant women and women on oral contraceptives, persons with respiratory allergies and other chronic respiratory and cardiovascular disease, individuals working with asbestos and other dust producing vegetable and mineral substances, persons exposed to ionizing radiation and rubber fumes, persons who work with chemicals that irritate the respiratory membranes, diabetics, and alcoholics.

The components of cigarette smoke are listed in Tables 1 and 2.(*5*) Their concentrations suggest that smokers can expect little benefit from the recent successful efforts to clean the air of our cities.

Epidemiologic analysis of cohorts of smokers, ex-smokers, and nonsmokers indicate that after 5-15 years of abstinence, ex-smokers can

TABLE 1. Cigarette Smoke: Gas Phase Components (mcg/cigarette*)

Carbon monoxide	13,400
Carbon dioxide	50,600
Ammonia	80
Hydrogen cyanide (hydrocyanic acid)**	240
Isoprene (2-Me-1,3 butadiene)	582
Acetaldehyde	770
Acrolein (2-propenal)	84
Toluene	108
N-Nitrosodimethylamine	0.08
N-Nitrosomethylethylamine	0.03
Hydrazine	0.03
Nitromethane	0.5
Nitroethane	1.1
Nitrobenzene	25
Acetone	578
Benzene	67

*85 mm nonfilter, blended cigarette (U.S.)
**Gas phase portion only (74 mcg/cig. in particulate phase)

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TABLE 2. Cigarette Smoke: Particulate Phase Components (mcg/cigarette)

Total particulate matter (TPM)*		
	wet	31,500
	dry	27,900
Nicotine		1,800
Phenol		86.4
O-Cresol		20.4
M- and p-Cresol		49.5
2,4 Dimethylphenol		9.0
p-Ethylphenol		18.2
B-Naphthylamine		0.028
N-Nitrosonornicotine		0.14
Carbazole		1.0
N-Methylcarbazole		0.23
Benz(a)anthracene		0.044
Benzo(a)pyrene		0.025
Fluorene		0.42
Fluoranthene		0.26
Chrysene		0.04
DDD		1.75
DDT		0.77
4,4'-Dichlorostilbene		1.73

*U.S. cigarette, 85 mm, without filter tip, 1968

look forward to morbidity and mortality which approach those of the nonsmoking population.(*1*) These studies also reveal that smokers and ex-smokers have health outcomes that are directly affected by the total number of pack-years of exposure. Thus, ex-smokers and nonsmokers can be expected to have less illness and lower lifetime health care costs than persons who smoke. Reduction or elimination of smoking may also prolong and improve the quality of the individual's life.

Smoking in the Navy

In the Navy and Marine Corps approximately 297,000 men and 10,500 women still smoke cigarettes (Table 3). This represents about 44 percent of the male and 25 percent of the female active duty population respectively. These percentages are at variance with those of U.S. civilian populations which approximate 38-39 percent for men and 30-34 percent for women.(*6, 7*) The differences are probably due to variations of the age-specific distribution of smoking populations in the military and civilian communities. On the positive side, our estimates indicate that 16-17 percent of active duty men and women, approximately 123,000 individuals, have given up smoking. Further, during the period between 1968 and 1978, cigarette sales in shore-based Navy exchanges worldwide dropped 28 percent from approximately 28 million cartons annually to 20 million cartons. Other records indicate that in Navy exchanges, dollar sales of cigarettes have remained nearly static during the past four years not withstanding the impact of inflation, an indication that the use of cigarettes may have decreased.

A preliminary review of hospital admissions for smoking-related diseases has been completed recently by the Navy Medical Data Services Center. Information was sought on the number of admissions and active duty sick-days for selected malignant neoplasms, diseases of the circulatory system, and non-neoplastic bronchopulmonary diseases causally related to smoking for the years 1974-1978.* Selection of appropriate diagnostic rubrics from the International Classification of Diseases Adapted -8th Revision was based on information provided in the report of the Surgeon General of the United States on smoking and health.(*1*) Information is available thus far only for the diseases noted. Evaluation of available data is continuing.

During the five years evaluated, smoking-related diseases accounted for 20,176 admissions to Navy medical treatment facilities. Approximately half of these (10,625) patients were active duty or retired Navy and Marine Corps personnel. For active duty personnel alone, 13,536 man-days were lost annually due to smoking-related illness. The

*Malignant neoplasms include those of the oral cavity, esophagus, pancreas, larynx, trachea, bladder, and kidney; diseases of the circulatory system include myocardial infarction, arteriosclerotic peripheral vascular disease and atherosclerotic aortic aneurysm; non-neoplastic bronchopulmonary diseases include chronic bronchitis, and emphysema.

TABLE 3. Estimate of Navy/Marine Corps Active Duty Smokers

Age	Men (%)	Women (%)	Total
< 25	154,784 (43)	5,472 (20)	160,256 (41)
25 & >	142,099 (45)	4,968 (35)	147,067 (44)
Total	296,883 (44)	10,440 (25)	307,323 (43)

TABLE 4. Admission Rates* for Smoking Related Illnesses in Active Duty Navy and Marine Corps Personnel, 1974-1978

DISEASE	RATE/100,000
Malignant Neoplasm of:	
Oral cavity	1.9
Esophagus	0.2
Pancreas	0.5
Larynx	0.6
Lung, trachea and bronchus	2.9
Bladder	1.3
Kidney	0.8
Circulatory Diseases	
Myocardial Infarction	21.2
Arteriosclerotic PVD**	0.8
Arteriosclerotic Aortic Aneurysm	0.7
Non-Neoplastic Bronchopulmonary Disease	
Chronic Bronchitis	9.6
Emphysema	5.6

*Age-Race-Sex Adjusted Rates per 100,000 average active duty strength per year.
**Peripheral Vascular Disease

annual cost was estimated at $3.9 million for direct health care plus $.5 million in active duty time lost. A listing of adjusted rates for specific categories is seen in Table 4. Women had lower admission rates than men for all diseases except chronic bronchitis for which their admission rate in all age groups was one and one-half greater than that of males of both races. Admission rates were approximately equal between white and black males with the following exception:

- carcinoma of the larynx was more common in white males, with no black patients reported,
- admission rates for myocardial infarction occurred two and one-half times more frequently in white males,
- admission rates for cancer of the kidney were approximately four times more frequent in black males.

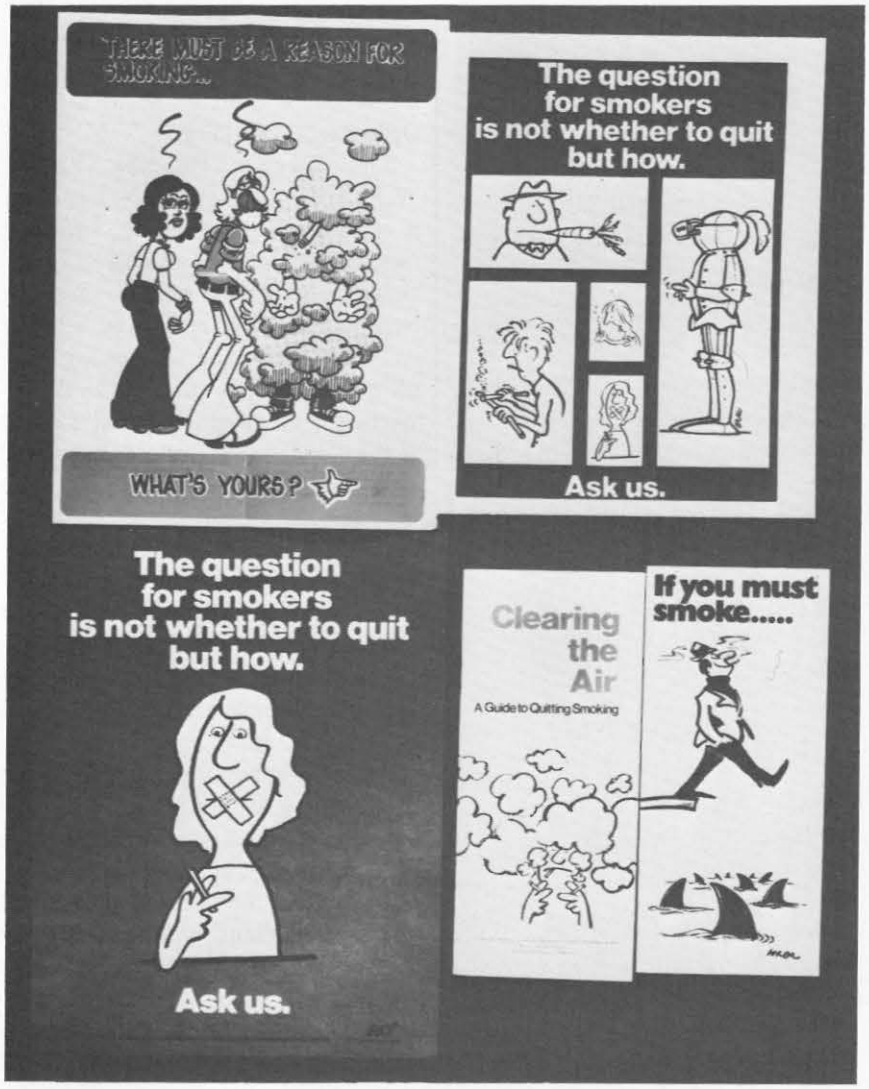
Intervention Efforts—Medical Department Actions

The Surgeon General, VADM W.P. Arentzen, MC, USN, has been a strong supporter of smoking modification efforts among all beneficiaries of Navy health care. In September 1977, he issued a letter to Navy physicians suggesting that all smokers who were Medical Department members break the habit if they were able and seek professional help if necessary. He also directed Navy health care personnel to refrain from the purchase or use of tobacco products in front of patients and encouraged them to assume a leadership role in smoking cessation. This was followed by BUMED Instruction 6200.10 which called for limitation of smoking in Medical Department facilities and for strong local programs in smoker education which would target their efforts on high risk groups.

VADM Arentzen assured that Navy physicians were among the first in the nation to receive the National Cancer Institute's brochure describing the "Help Smokers Quit Kit" and encouraged the kit's use in patient care. This was followed in December of 1978 by the Department of Health, Education and Welfare Annotated Bibliography on Smoking and Health which also was mailed to all Navy physicians.

Clinics

Although it is recognized that up to 90 percent of ex-smokers may discontinue smoking without outside help, some individuals will benefit from the support provided by smoking modification clinics. These efforts are usually aimed at helping the individuals to stop smoking or at least to reduce the frequency with which they smoke or



Education is an important part of the Navy's Clearing the Air Program.

switch to lower tar and nicotine brands. Ideally, facilitators conducting these clinics should be ex-smokers themselves and members of the community from which the subscriber population is drawn. It would be inappropriate, therefore, for Medical Department personnel alone to attempt to conduct these modification clinics without the active support of the Navy community at large.

Early in FY79 Medical Department funding was provided to develop a pilot smoking cessation program at NRMC Portsmouth, Va. This program is currently in its sixth month of operation under the direction of CAPT T.G. Williams, MC, USN, and Nelda Knoblock. Other smoking modification clinics are currently being conducted at NRMC San Diego, NRMC Charleston, and NRMC Jacksonville, as self-help efforts. Requests for information/assistance in developing programs have been received from Roosevelt Roads, Okinawa, and Pearl Harbor. Like all health promotion programs, smoking modification and education efforts require the support of the total Navy community. In seeking this support it is imperative that they not stir up defensive guilt in smokers or interfere with operational commitments of the military and civilian work force.

Facilitator Workshops

In the Spring of 1979, the Naval Environmental Preventive Medicine Unit No. 2 hosted a training workshop for fleet personnel who desired to act as facilitators in smoking modification workshops aboard ship. This workshop was 100 percent oversubscribed and it appeared that further efforts in this direction should be initiated.

Additional facilitator workshops were conducted in Norfolk and San Diego in January 1980. Each was held with the joint cooperation of the American Cancer Society, the National Cancer Institute, and members of the Navy Medical Department. The San Diego course was held in conjunction with the 22nd Navy Occupational Health Workshop. Further facilitator workshops will be planned, if indicated, at different locations on both coasts on a periodic basis, and Navy commands ashore and afloat will be encouraged to participate on a voluntary basis. Participation of unofficial organizations within Navy communities such as Wives' clubs, Parent-Teacher organizations and the like will also be sought.

Other Initiatives

The Navy Medical Department has encouraged cooperative studies to investigate various ways to modify smoking behavior. Such an evaluation is being conducted at NRMC Charleston with the Johns Hopkins University. A second study at Charleston is being developed in cooperation with the National Cancer Institute.

During the coming months, in cooperation with the National Cancer Institute, Office of Cancer Com-

munication, we hope to launch broadened educational efforts targeted on active duty personnel and other beneficiaries exposed to increased risk. We will also develop and distribute media materials on smoking education aimed at all segments of our beneficiary population.

The author serves as the DOD representative to the National Interagency Council for Smoking and Health. This organization seeks to broaden smoker and nonsmoker education and to provide for cessation efforts.

Smoking has been identified by the Surgeon General of the United States as the first-ranking health problem in the U.S. today. Documentation in support of this position has been widely circulated for the past 20 years. Smoking-related diseases have a significant impact on active duty personnel, retirees, and dependents. Increased emphasis is being placed on expanding our education efforts in smoking and health so that they reach all segments of the Navy community. Important additional efforts are being made to train health care personnel in aiding patients to modify their smoking behavior. The Medical Department also is assuming a leadership role in providing for the training of leaders in our Navy community who wish to initiate smoking education and modification workshops in their commands or in unofficial service organizations. The smoking modification program should be viewed as part of the Medical Department's effort to enhance definitive health promotion. It joins other Navy prevention efforts such as those already directed toward infectious disease, occupational illness, alcoholism, spouse and child abuse, rape, and improved physical fitness and nutrition.

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Augmentation for MSC Officers

Most initial appointments into the Medical Service Corps are made in the U.S. Naval Reserve component or for temporary service in the Regular Navy. The latter applies only to officers appointed directly from enlisted status under the Inservice Procure Program as promulgated in BUPERSINST 1120.15N of 25 May 1979.

MSC officers who seek career status achieve this distinction through the process colloquially referred to as "Augmentation." This results in reappointment in the Regular Navy for permanent service.

Inasmuch as officers of the Regular Navy serve indefinitely and at the pleasure of the President, commitments for specified periods of service are not required. Temporary officers augmented into the Regular Navy for permanent service are no longer subject to reversion to an enlisted grade should future policies require force level reductions. In addition, Regular officers enjoy the advantages of retention and future training and education. Past trends also indicate that Regular officers, because of their prospective tenure, are more likely to be promoted, particularly to the grades of commander and captain.

Augmentation is a competitive process, originating in statutes requiring a portion of the active duty force to be held in reserve or temporary categories. Although there will continue to be limitations on the number of augmentations, the exact number will vary from one augmentation board to the next. These amounts reflect ever changing Navy requirements. For example, over the past 10 years, increasing numbers of MSC officers have elected to remain on active duty beyond their initial obligations and seek augmentation into the Regular Navy. This has reduced available Regular Navy vacancies for augmentation.

The Secretary of the Navy convenes augmentation boards twice each year, in February and August. MSC officers serving in the grades of lieutenant (junior grade) and lieutenant are eligible to apply for augmentation as are those officers serving for less than two and one-half years in the grade of lieutenant commander. Other basic eligibility criteria include U.S. citizenship and completion of more than two years of active commissioned service as a MSC officer. Educational achievement enhances one's competitive position for augmentation; however, the determining factor is performance.

During 1979 all Naval Reserve and temporary officers who were serving past their second, but less than fifth, year of commissioned service were automatically screened for augmentation. This practice will be discontinued for MSC officers commencing with the February 1980 board. Officers who have not previously requested augmentation may submit their applications at any time after becoming eligible. Officers who have previously requested augmentation but were unsuccessful in obtaining an appointment in the Regular Navy are required to wait one year prior to reapplication. Those who accept augmentation into the Regular Navy agree to remain on active duty for at least two years. Detailed application procedures are contained in Article 1020120 of the BUPERS Manual.

Common Sense Runs Corpus Christi Energy Program

In June 1979, U.S. NAVY MEDICINE reported on the status of the Navy's energy conservation effort. Almost as we went to press, it was announced that NRMC Corpus Christi had won the Secretary of the Navy's Energy Conservation Award for small shore facilities for FY78. U.S. NAVY MEDICINE decided to examine that activity firsthand and learn what constitutes a successful energy conservation program, one that further reduced consumption in the past year by an additional 8 percent and by 46.7 percent compared to the 1975 baseline, the reference by which all facilities are judged.*

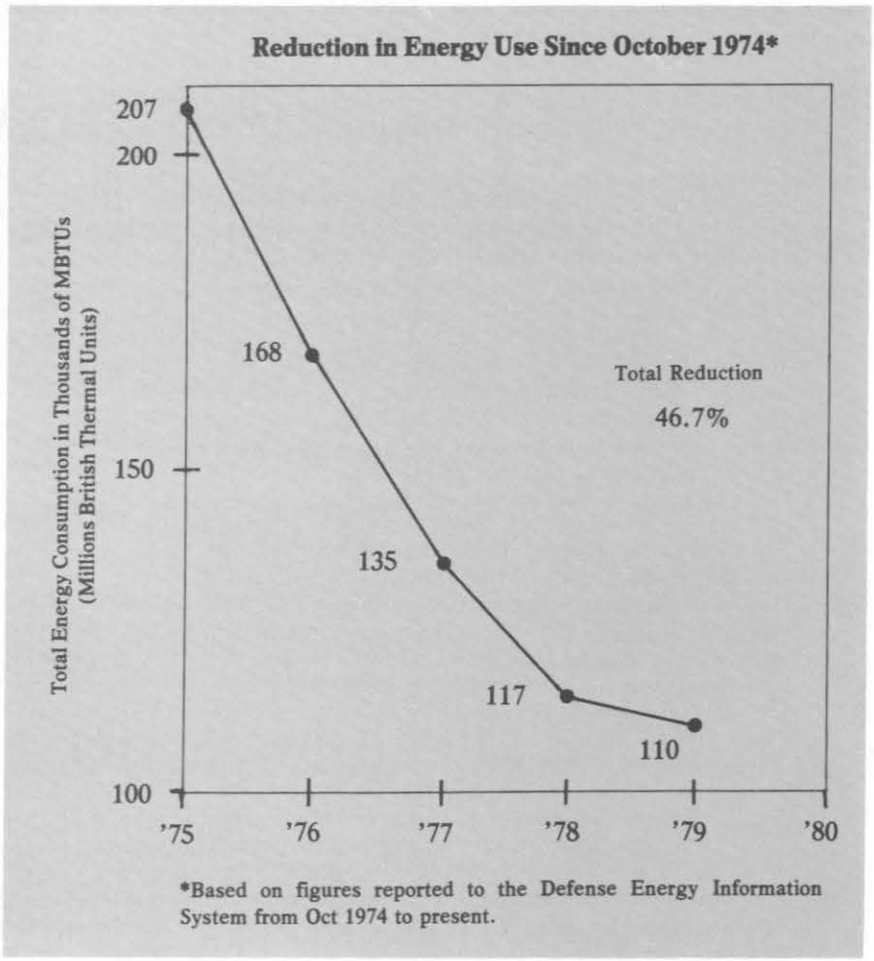
NRMC Corpus Christi gleams in the Texas Gulf coast Sun. Its clean, white, cast concrete and windowed facade represents the functional and aesthetic ideals so often taken for granted in the last two decades. Built to replace a wood frame hospital destroyed by Hurricane Celia in 1970, the 195-bed facility was designed in the mid-60s when energy conservation was not an inherent design consideration.

But even as it opened its doors in April 1974, the cost of supplying heat, air conditioning, and light was running about $900 per day and utility rates were rising so rapidly that NRMC Corpus Christi was beginning to look more like a white elephant than a modern showplace. Clearly, something had to be done to bring costs under control.

The task was so formidable that Henry Nau, head of Planning and Maintenance, began with the simpler thing first. He felt that some immediate and dramatic successes would spur the program. Once there was momentum, the more expensive and complicated problems could be tackled more easily.

His emphasis on team effort was the key. "We really tried hard to listen to everyone who had an idea," he said. "All our people were experienced and none of them were strangers to the business. Many had good ideas. We sorted them and decided which ones to start with and which ones would have to be deferred until money and time were available." His crew was made to feel that they too had a stake in converting a crude, factory-built product into a finely tuned machine.

On index cards, they inventoried 79 pieces of equipment that used significant amounts of energy. This file focussed attention on what



*Based on figures reported to the Defense Energy Information System from Oct 1974 to present.

*The baseline is defined as the energy consumed by an activity between 1 Oct 1974 and 30 Sept 1975.

The reason for a new medical facility: The aftermath of Hurricane Celia, August 1970.

equipment would be modified or eventually replaced.

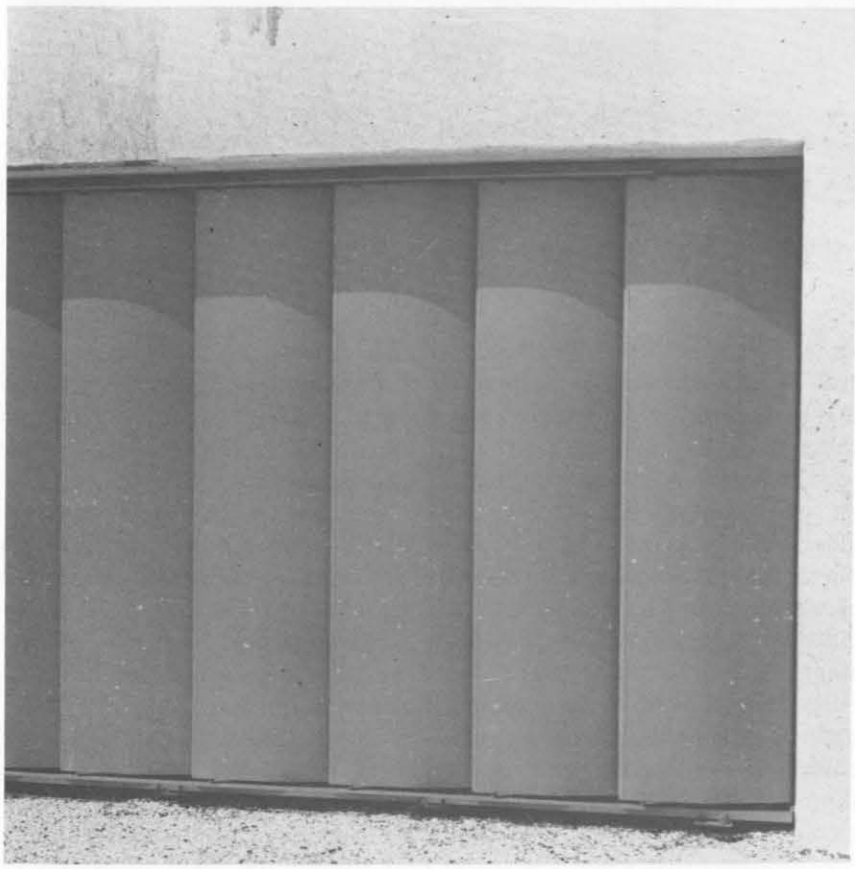
One of the simplest procedures was the replacement of corridor light switches with 150 toggle switches installed in the overhead junction boxes beside each fluorescent fixture. For changing conditions or where lighting was found to be unnecessary, the work force could turn off the switches. Two hundred eighty-one four-tube fixtures were turned off at a saving of about 531,000 kilowatt hours (KWH) per year. This meant a $5,000 annual savings on the electric bill.

Nau and his staff looked next at air handlers, chillers, ventilators, and pumps—motorized machinery that accounted for the greatest percentage of the hospital's energy requirements. A steam absorption air conditioning chiller was the chief villain. For factories and generating plants that produce large quantities of waste steam, such a system is quite efficient. But in this case, the steam had to be piped over three miles from the Naval Air Station's main heating plant to the absorption chiller and operating costs were three times as much as equivalent electrically powered chillers. After modifications that made the steam absorption chiller the secondary unit, it was eventually replaced in favor of all electric. In FY81 an even more efficient electric chiller is scheduled to replace the older electric chiller.

One aspect of Nau's common sense approach to conservation often means getting two jobs for the price of one. The vertical louver project, the next large cost item on the plan, is the most graphic illustration of this philosophy.

Corpus Christi, like so many Gulf coast cities, is subject to hurricanes and other tropical storms. In fact, the Naval Air Station took a direct hit during the 1970 onslaught of Celia, the storm that destroyed the

Adjustable louvers block the afternoon Sun . . .



. . . and stormproof the second floor window walls.

original Naval Hospital.

Wind damage remained a potential problem for the new hospital. Especially vulnerable were the tempered glass window walls on the second floor. With storm winds often exceeding 80 miles per hour, loose pieces of roof gravel and other debris become high speed, glass-shattering projectiles. Many windows of the new building certainly present ample targets. The mere threat of violent weather used to mean nailing plywood sheathing over many of the building's windows at a great cost in material and labor. Protection is, therefore, a key consideration.

Equally important was the problem of solar heat gain. The prevalence of a very high Texas Sun much of the year, and floor to ceiling glass in many areas, raised the inside temperature enough to add up to a sizable air conditioning bill. If certain exposures could be shielded sufficiently, perhaps the bill could be reduced.

The answer to both the hurricane and the air conditioning problem lay in the trial application of adjustable vertical louvers on the building's eastern exposure. Aluminum panels similar in construction to aircraft wings were mounted vertically and parallel to one another. Each panel rotates on its vertical axis and is linked to its adjacent foil by a horizontally moving bar. The bar is linked by rack and pinion to a roof-mounted motor controlled by switch from within the building (Cover photo). Designed to withstand 150 mile per hour winds when fully closed, the louvers give the building pushbutton storm protection. By adjusting the louvers, solar heat gain is just as easy to control. The Sun's heat can be diverted two feet outside the glass during the summer or accepted during the winter when it is advantageous.

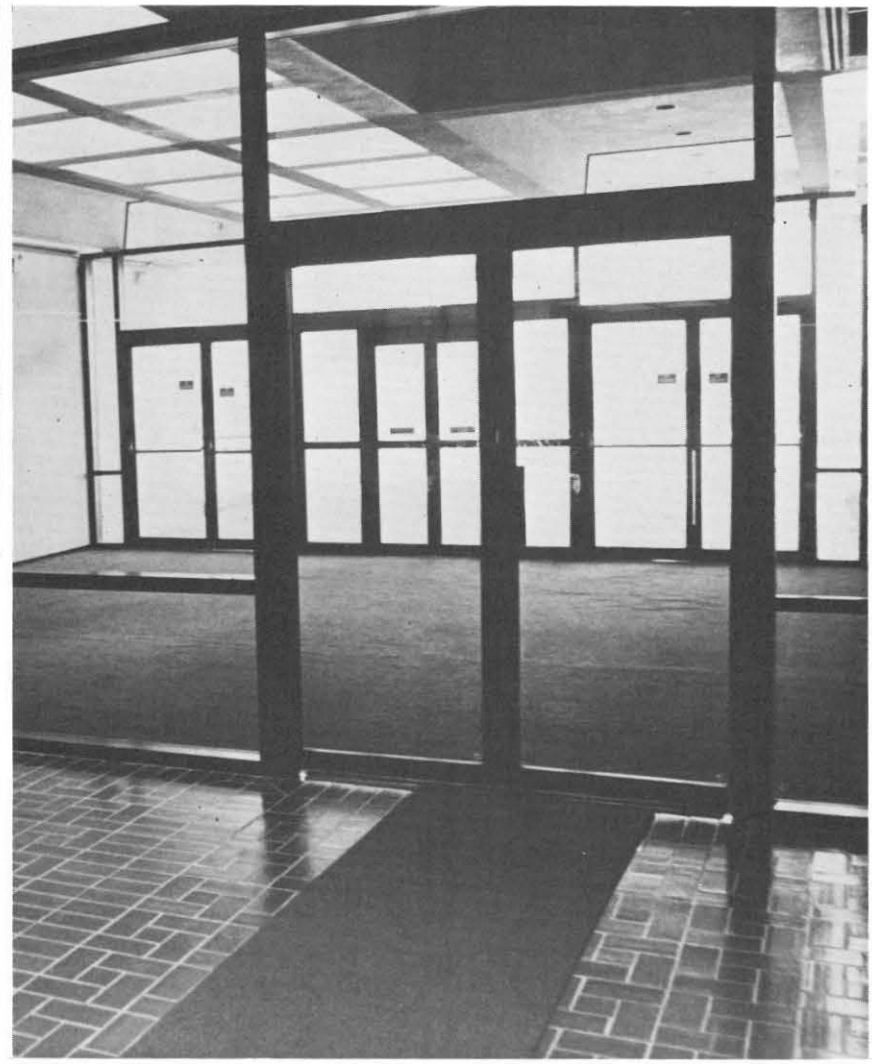
The trial application of this in-

novative system was so successful that louvers were later installed on the southern and western exposures.

Nau applied the double duty principle to the roof as well. Even with more adequate window protection, anchoring gravel on the hospital's expansive, flat first floor roof posed a continuing dilemma. The traditional black, asphalt-base adhesive eventually lost its grip and required repeated applications. The solution —a white, highly reflective plastic coating which also adequately bonds the gravel. The substance's reflectance is very dramatic. To the casual observer wandering about on the roof, one thing is readily apparent; sunglasses are ineffective. And at midday, with the Sun blazing overhead, one can comfortably touch the lukewarm, white coating. Soon after it was applied, air conditioning mechanics immediately reported a reduction in ammeter readings on the chiller. The new adhesive was doing its job.

Many of the other modifications, while not expensive, provided dramatic reductions in energy usage. One minor modification involved the facility's domestic water supply. All incoming water used to come directly to a central storage tank in the sub-basement. In order to supply water to the fifth floor, two 40 horsepower pumps had to draw water from the tank and raise it from 0 to 70 pounds pressure. But more than half this pressurized water never went beyond a ground-level cooling tower. The simple solution involved routing the required amount of incoming water directly to the cooling tower. One four-inch bypass valve, a few flanges and bolts, and two hours of overtime cut the pumps' running time in half.

In one case redundancy built into an original system was found to be inefficient and unnecessary. The original air conditioning used two chilled water pumps and two hot deck water pumps in parallel in a fail-safe mode. Adequate maintenance and careful monitoring allowed one pump in each pair to be secured at a savings of 888,000 KWH per year. A further adjustment in this system involved raising the chilled water from 42°F to 54°F and lowering the hot water temperature. The system has not been significantly affected and the energy savings is considerable.



The new outpatient entrance on the building's north side.

Shutting off or disconnecting other unused or infrequently used appliances also saves energy. An unworkable combination trash and linen chute used a blower that consumed 639,000 KWH per year. It is no longer used. Now the small amount of trash is transported in plastic bags.

Coordinating the duty day with the operation of hospital systems has become a ritual. No system from a single fan to a large air handler has been overlooked. A galley exhaust fan that once ran 24 hours a day now runs from 0530 to 1800, saving 39,300 KWH per year.

The second floor is occupied by

Installation of trial thermal window . . .

. . . with integral venetian blinds.

relatively few administrative personnel who spend most of their time in office spaces air conditioned by a separate air handler from the air handler servicing the corridor. The air handler that serviced that particular corridor has been shut down at a savings of 53,350 KWH per year with no noticeable decrease in comfort. In addition, the air handler servicing the second floor office spaces was operating 24 hours per day. With duty hours from 0800-1630 five days a week, and with worship services held in the second floor chapel on Sunday morning, this system is now turned on each weekday between 0400 and 0730 and turned off at 1700. It is not used on Saturdays, Sundays, and holidays except for one hour of Sunday worship service. Approximately 175,000 KWH per year are now saved. A single exhaust fan in phase with this system can also be secured when unneeded, saving an additional 10,000 KWH per year.

Several building modifications have proven effective. Original design entrances allowed conditioned air to escape and also let outside air in. The biggest culprit was one basement doorway used for most of the building's deliveries. The swinging double doors, in almost constant use, were often propped open to allow free passage. In addition, the abuse they took from wayward handtrucks and dollies resulted in frequent repair or replacement. The solution lay in a set of sliding doors automatically actuated by a motion detector on the inside and a pressure mat on the outside. Repairs have subsequently been eliminated, delivery has been simplified, and loss of conditioned air has been minimized.

Altering the outpatient entrance on the north side of the building also reaped multiple benefits. The original entrance consisted of two window walls set about six feet

apart, each having two sets of double doors. Patients on crutches or in wheelchairs or parents pushing carriages had a difficult time opening the doors. Often, they too were propped open to facilitate passage, again allowing conditioned air to escape or a cold winter wind to whip unobstructed through the waiting room. The outside wall was moved out closer to the street in order to make a 24-foot space between window walls. The installation of a set of sliding automatic doors actuated by motion detectors now allows the outer doors to open for a minimum time before the inner doors will be opened. Energy is saved and the benefit to handicapped patients is considerable.

Modifications in the Aviation Physiology Training Unit at a cost of about $550 for material and eight days labor have resulted in greater comfort for students and additional energy convervation. Because of frequent modification and anticipated replacement of the Unit's decompression chamber, one 16 x 20-foot section of the building's south wall was removeable, being made of bolted steel framing and a light gage steel sheet. Unfortunately, with the afternoon Sun beating upon it, the steel doubled as an unwelcome radiator, adding heat the air conditioning simply could not handle.

The hospital carpenter and painter added inch and half thick insulation to each of the wall's panels and finished it off with an attractive non-

An Energy Program for the 80s

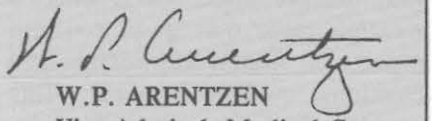
On 29 Nov 1979 I signed BUMEDINST 4100.2, "Management of Energy Resources." This instruction marks the beginning of a new era for energy conservation within BUMED.

The demand for energy in naval health care facilities is increasing. In almost all cases, fossil fuels are the source energy form for electricity and steam. Fossil fuels are becoming more expensive and are now expected to be in short supply within the expected life cycle of the systems they support. As energy demands within the United States increase, there is a greater need for foreign oil and other fossil fuels. This, in turn, makes this Nation dependent on the countries providing our imports. The combination of foreign dependency and rising costs could seriously impair the Navy's ability to fulfill its responsibilities.

After an initial reduction of energy consumption at naval medical activities in 1973, there has been a steady trend of increased energy consumption. Generally, this trend has been caused by the following:

- Our newer facilities were designed and funded during an era of cheap, readily available energy. These buildings were state of the art when opened and are consequently energy intensive with little thought given to minimizing energy consumption through design.
- Our older facilities have been retrofitted to accommodate advancing medical technology. With the high initial cost of much of this equipment, ways and means were sought to install the equipment as inexpensively as possible. Often, modifications to power supplies were made only to insure safe operation of new equipment. Incorporating energy saving techniques into electrical systems was not adequately addressed.
- Central heating, ventilation, and air conditioning systems have been incorporated into facilities on a retrofit basis. Again, getting the system operational came first, while sacrificing energy savings. As this equipment ages, operating expenses and energy consumption increase.

Aggressive use of established energy programs, such as those discussed in this issue of *U.S. NAVY MEDICINE,* will generate many energy saving projects. The specific guidance set forth in this new instruction provides a firm foundation from which all naval medical activities can develop projects which will capitalize all available programs. Conscientious efforts by each activity to improve all facilities will result in energy savings and, in many cases, actually improve comfort and facility operations. I urge your support in helping to achieve our goals.



W.P. ARENTZEN
Vice Admiral, Medical Corps
United States Navy

flammable fabric. The bolts remained exposed for easy access. Heat load has been reduced and the staff and students teach and learn in newfound comfort.

An important aspect of the Nau philosphy is the willingness to experiment—conservatively. Before retrofitting an entire hospital at great cost, he will thoroughly evaluate a single unit's effectiveness. Only then will there be a commitment to a complete retrofit. Such was the case with the already described louvers. Possible replacement of the hospital's original 88 windows is another example. These single-pane windows have provided their share of headaches in the past few years. They are anything but energy efficient and have proven to be a poor barrier against wind-driven rain.

After careful shopping, a contractor was found willing to install a single thermal window on a trial basis. The unit consists of a one-quarter inch plate outside and a three-sixteenths plate inside. Sandwiched between are adjustable venetian blinds. The window is designed to withstand high winds, contains a beefed-up gasket, and is tinted to reflect unwanted solar energy. If the window meets the rigid requirements, all the existing patient room windows will eventually be replaced.

Although building and equipment modifications have been highly successful, energy efficiency has also been tackled in another way. Weather is a key factor in keeping the building tuned for maximum energy efficiency. The Planning and Maintenance office now monitors a weather radio that gives constant reports on frontal movements and changing weather patterns. This enables engineers to adjust equipment in advance. The radio also has an alert feature that automatically broadcasts the existence of thunderstorms and other violent weather changes. Advance warning provides ample time to close the louvers and make other adjustments.

Continuing success in reducing energy consumption and the winning of the SECNAV award have not lessened the commitment or the enthusiasm. Several new projects have recently been completed or are underway.

Separate fan-coil units were just installed in the vacinity of the emergency room. Because the ER requires round-the-clock climate control, a large air handler that also serviced an adjacent area had to be running constantly, even though that space was not occupied nights or weekends. Now when the large unit is shut down at 1630 each duty day, the separate fan-coil units take over for the ER alone. Energy requirements have dropped from 178,755 KWH per year to 11,300 KWH per year. The $6,000 project will have a payback of less than a year.

The sub-basement, the scene of the earlier water valve diversion project, will soon have a new variable speed pump that will deliver the required water to the hospital's upper floors without having to operate the large air compressor pumps. The air compressor pumps will remain available for emergencies.

An energy monitoring and control system (EMCS), scheduled for installation in FY81, will consist of an operator's console, graphic slide display, remote data gathering panels, load cyclers, and an audio capability between console and panel. The system will allow a central operator to monitor temperature, humidity, motor operation, etc. He will be able to remotely perform load cycling and start and stop operations of equipment. The EMCS has an estimated payback of 3.2 years.

Many more improvements could be made and ideas abound for trimming energy usage even further. One plan utilizes the almost constant breezes blowing in from the Gulf. It involves the replacement of the building's 49 roof ventilators. In 1977 those exhaust fans chalked up a $41,000 bill! Combination wind and battery powered fans could reduce that expenditure significantly. Under normal conditions, the prevailing wind would both turn the fans and charge storage batteries. Under calm conditions, the fans would run off the batteries and draw no additional power from the main line.

The other project, no less ambitious, would use the large, clear roof area for solar collection. Presently, two large hot water tanks in the sub-basement use steam to bring water to temperature. Solar collectors mounted directly above on the first floor roof could easily heat the water to at least 115°F. This is all that is required except for the galley. In keeping with his conservative approach, Nau would first like to test a five-square-foot solar collector before a plan is submitted for funding.

Further refinements at NRMC Corpus Christi continue, supported by the total commitment of its commanding officer and the dedication of the Planning and Maintenance Service. All operate under the philosophy that money saved on energy can be used to provide better health care.

More importantly, this medical facility is a graphic example of what can be accomplished, not through large expenditures and the massive employment of advanced technology, but through common sense and the simple application of sound engineering principles. At Corpus Christi, energy conservation is anything but a passing fancy. It is a way of life. —JKH

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Streptococcus mutans and Dental Disease in the Navy

I.L. Shklair, Ph.D.
B.L. Lamberts, Ph.D.
CAPT G.E. Clark, DC, USN
CAPT M.R. Wirthlin, Jr., DC, USN

The Problem of Dental Disease in the Navy

Dental caries and periodontal disease are almost universally present in young men and women entering naval service. A recent epidemiological survey at the Naval Dental Research Institute (*1*) indicated that the average recruit enters the Navy with over three times the number of carious teeth as found in comparable age groups of civilians, and is afflicted to some degree with gingivitis or other periodontal involvement. In 1,000 recruits we can expect to find 6,470 decayed teeth, and 490 of the men would have extensively mutilated teeth. This results in a huge workload (Table 1). In addition, the recruit develops two to three new lesions during his first year of service. The residual of oral disease in personnel assigned to operational billets is extensive and, as a result, there have been repeated instances of operational compromise secondary to acute dental emergencies.

One of the principal thrusts of the program of research at the Naval Dental Research Institute, Great Lakes is the control of dental decay, with *Streptococcus mutans* as the major factor in the initiation of this dental disease so rampant in Navy personnel. Studies at our laboratory are serving as the basis for the development of effective means to prevent and treat the dental disease associated with operational decrements in Navy and Marine Corps forces.

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S. mutans—The Microorganism

The microorganism *S. mutans* has been strongly associated with caries activity in man and laboratory animals and is considered to be the prime etiologic agent of dental decay (*2,3*) (Figures 1 and 2). This paper will review our early work with *S. mutans* that was directed toward understanding its physiology and chemistry, determining its epidemiology relative to its location in the mouth, and clarifying its relationship to dental caries. Then we shall describe some of our current projects for methods to control or eradicate the organism in the mouth in order to reduce the future increment of dental decay.

Strains of *S. mutans* ferment sucrose (table sugar) to produce acids which cause tooth decay. The organisms can also produce extracellular polysaccharides from

TABLE 1. Dental Treatment Requirement for 1,000 Incoming Naval Recruits

Amalgam (1 surface)	3,369
Amalgam (2 or more surfaces)	3,263
Resin Restorations	760
Crown or Bridge	39
Partial Denture	29
Extraction	602
Scaling (periodontal)	811
Prophylaxis	995

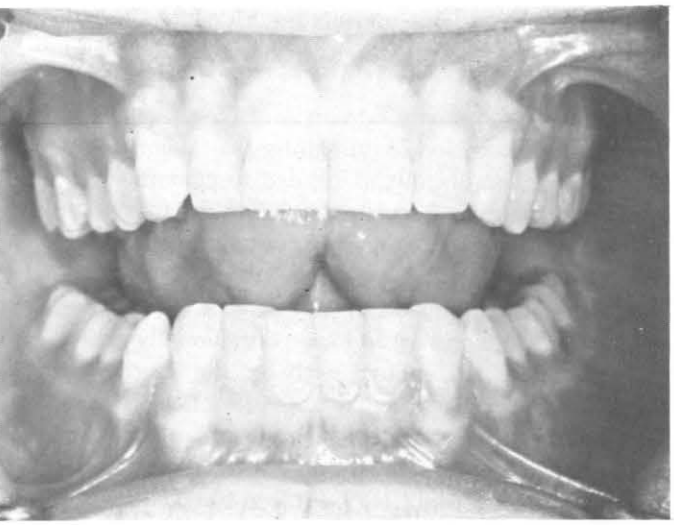

FIGURE 1. Caries-free individual. S. mutans, if present, are in low numbers, and fewer tooth surfaces are infected.

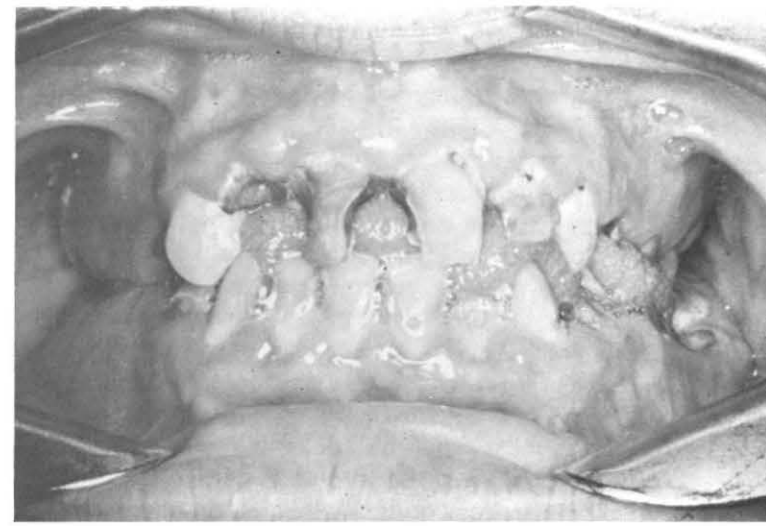

FIGURE 2. Caries-rampant recruit. S. mutans present in lesions and in high numbers on most tooth surfaces.

sucrose (Figure 3). In the process, the sucrose—a disaccharide of glucose and fructose—is split. The glucose moieties are then linked together into chains called glucans, while those of fructose are linked into chains called fructans or accumulate as free fructose. The glucans produced are a mixture of water-soluble and water-insoluble polysaccharides.

The glucans appear to aid in the colonization of the organisms on tooth surfaces,(*6*) since they are sticky and help organisms to adhere to the tooth surface and to other organisms. Glucans may also provide protection against the mouth's natural defenses by forming a cell coat that might prevent phagocytosis by neutrophils or exclude antibacterial components of saliva.

S. mutans preferentially colonizes tooth surfaces, the most prevalent site being the surfaces between adjacent posterior teeth.(*7*) Although the oral cavity is the organism's major habitat, it can also be found in the intestinal tracts (feces) of individuals whose dental plaques harbor many of these organisms.(*8*)

Epidemiology of S. mutans

To date there have been limited studies dealing with the worldwide distribution of these organisms in man. The organism has, however, been isolated wherever it has been looked for throughout the world. It does not appear to be associated with one standard of living, as *S. mutans* has been found in the most affluent of societies as well as in the primitive peoples of New Guinea and isolated villages of South America.(*9,10*)

Our laboratory has also been interested in the geographic distribution of various types of *S. mutans*. Over 95 percent of recruits serving at Great Lakes, Orlando, and San Diego, are primarily carriers of a type known as biotype c. Approximately 10 percent are infected (along with biotype c) with biotype d and/or e. It is extremely rare to find recruits with biotypes a or b. Saudi Arabian naval personnel were examined at our laboratory and were found to have more multiple biotypes and were greater carriers of biotypes d (53 percent) and e (28 percent) than U.S. naval recruits.(*11*)

A study of the worldwide distribution of various types could be very important, particularly with the current interest in the development of an "anti-caries

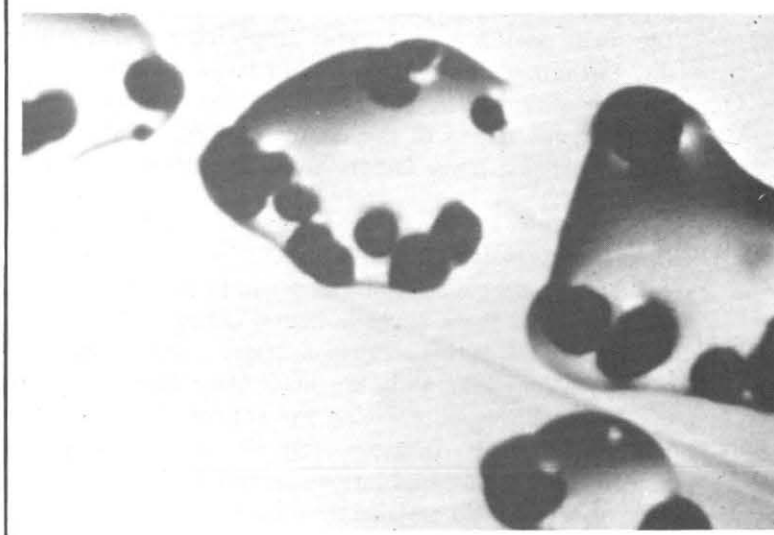

FIGURE 3. Colonies of S. mutans. The clear areas around the dark colonies are the extracellular polysaccharides (glucans).

vaccine." The use of the proper bacterial cells or their products to develop a vaccine for a particular area may be critical. For example, in a country where the people carry primarily a type c, the use of a vaccine made from a type d, may not be very effective.

Most populations studied relative to the prevalence of *S. mutans* have been of children and young adults, since they have the highest incidence and prevalence of dental decay. It is generally agreed that the oral cavities of newborn children are free of *S. mutans* and remain free of the organism until suitable tooth surfaces are present for colonization. In a study conducted by Catalanotto, Shklair, and Keene(*12*) in a group of Navy dependent children three to five years of age, the organism appeared to preferentially colonize the interproximal areas of the molars. Kozlowski, Shklair, and Keene(*13*) found that in children, 4 to 16 years of age, 67-82 percent were carriers of *S. mutans*. In our recruit population the prevalence of *S. mutans* from noncarious sites was 93 percent in subjects with caries or a history of caries. In recruits who had never experienced dental decay the isolation frequency of this organism was 78 percent, with the numbers and tooth sites infected being substantially lower than for subjects with caries experience.(*14*)

The organisms can, in almost all cases, be found in carious lesions. On the other hand, for the noncarious tooth surfaces, the occlusal and interproximal sites are the areas most often colonized, while the buccolingual smooth surfaces of teeth are least colonized.

A word of caution seems to be indicated before one draws premature conclusions from the epidemiological studies which deal primarily with the isolation of the organism. The mere presence of *S. mutans* at a site on the tooth does not necessarily imply that caries will develop at that site. Certainly other factors, such as the number of organisms present, the amount of sugar in the diet, the status of the enamel surface, and additional host-resistance factors are of importance.

Cause and Effect Relationship

Do *S. mutans* cause dental caries in humans? Or, are the organisms there because dental caries is present? In other words, is this a cause or effect relationship? In a study at our laboratory we have been following individuals who, upon entering the service, have never had dental decay. Approximately 50 percent of these men develop their initial carious lesions during the first year of service. No cavities developed in the men who were initially free of *S. mutans* and remained free of the organism during the one-year interval.(*15*)

If an assumption is made that *S. mutans* is associated with caries activity, the possibility of controlling or eliminating the organism from the mouth must be considered.

To test this hypothesis, Edman *et al,* (*16*) in our laboratory, have succeeded in implanting *S. mutans* into young adults. The organisms tended to remain where they were implanted. A few areas near to the implanted sites became infected, but only for short periods of time. In one subject, the organisms were never found on the nonimplanted side of the mouth. In another subject, the organisms were found occasionally on the opposite side of the mouth early in the study, but quickly disappeared. Since it seems difficult for *S. mutans* to become established in young adults and since the implanted organisms do not have a tendency to spread in the mouth,(*16,17,18*) it is believed that if one could eliminate *S. mutans* from our recruit population, it might be possible to prevent reinfection and thus reduce the future increment of dental decay.

Attempts to Eliminate S. mutans

In order to eliminate the organism from the mouth, a number of approaches have been tried in our laboratory. Initially, the effect of eliminating all carious lesions on the prevalence of *S. mutans* was determined by Keene, Shklair, and Hoerman.(*19*) Men with extensive tooth decay were sampled and 70 percent of the sites sampled were found to harbor *S. mutans*. After all the carious lesions were restored, the sites were resampled periodically. Initially, there was a dramatic drop of 70 percent for the sites that harbored *S. mutans*. With time, more sites became positive, but not to the preoperative levels. After six months, new baselines were established and the effect of a regular Navy stannous fluoride prophylaxis on the prevalence of *S. mutans* was determined. There was an initial drop down to 16 percent positive sites, followed by a slight continuous rise to 25 percent of the sites remaining infected.

Other procedures were then tried. It was reasoned that, if a medicament could be delivered directly to the primary sites of infection—the interproximal areas—it might be possible to eliminate the organisms from these areas. The medication was delivered by applying it to the waxed floss, and the floss then "worked" between the teeth. Povidone-iodine(*20*) or stannous fluoride(*21*) was applied in this manner at one sitting or in multiple applications. In all cases there was a sharp initial drop in the number of positive sites for *S. mutans*, but in no instance were all of the organisms completely eliminated. The area with the least number of organisms prior to treatment generally became

negative and often stayed negative throughout the test period. The failure in these experiments to eliminate *S. mutans* completely from the mouth was probably due to there being too little antibacterial agent in contact with the organisms for a sufficient time. During these studies it seemed that ordinary waxed dental floss was neither an efficient debriding agent nor an effective was to delivery the test agents to the interproximal sites. Work with an absorbent two-strand cotton yarn or "Super Floss"* is now being tested for this purpose. Long-term studies are in progress to evaluate the effect of these procedures on the prevalence of *S. mutans* in the oral cavity and on the subsequent incidence of dental caries.

Enzymatic Approaches to Control

Other approaches for the control of dental caries are also being studied. The effects of enzymes to degrade the sticky glucans are being investigated in our laboratory by Lamberts, Simonson, and Pederson. Dextranase breaks up the 1,6-linked glucans, but it does not affect the 1,3-linkages (water-insoluble) in the streptococcal glucans. The water-insoluble glucans are only partially degraded by dextranase, leaving residues that may contain in excess of 90 percent 1,3-linkages.(*22,23*) The degradation of such residues requires enzymes which are not commercially available. However, it is reasonable to assume that a combination of dextranase and 1,3-glucanase could degrade the streptococcal glucans, thus interfering with the attachment mechanism of the organisms to the teeth. Simonson and Lamberts in our laboratory, are currently screening various natural substrates as sources of 1,3-glucanases. If promising sources of these enzymes can be identified, the enzymes will be isolated and tested as plaque control agents in combination with commercial dextranases or with a *Fusarium* dextranase that has recently been isolated by Simonson, Liberta, and Richardson.(*24*) A major problem in the clinical application of enzymes is that they are frequently diluted and washed away from the tooth surfaces before the degradation of the adhesive glucans can be accomplished. Our laboratory is investigating methods to modify dextranases and 1,3-glucanases so that they will adhere to tooth surfaces, thus lengthening the period of their effectiveness. The discovery of 1,3-glucanases, along with the techniques of enzyme modification, should help overcome some of the previous failures using dextranases alone.

*Super Floss, Education Health Products, Inc., New Canaan, Conn. 06840.

Validating Therapeutic Effectiveness

To evaluate the effectiveness of various therapeutic agents or procedures for controlling *S. mutans,* a fairly simple and accurate test has been developed in our laboratory for detecting the presence or absence of these organisms in dental plaque samples. This test consists of a semi-selective bacterial medium to which is added a plaque sample. If *S. mutans* is present, the medium exhibits a color change from purple to yellow in 24-72 hours. The greater the number of *S. mutans* in the sample the faster the color changes. A color change in 24 hours indicates the presence of a great many *S. mutans* and the potential for caries activity. A color change in 72 hours or longer indicates that less of these potentially cariogenic organisms are present. The test is very accurate and could be used as a guide for special preventive dentistry procedure by clinicians to help reduce the numbers of these organisms and control dental caries.

A Navy Program of Disease Prevention

Preventive dentistry treatments of oral prophylaxis, plaque control instruction, and fluoride applications comprise current professional therapy. Oral prophylaxis involves removal of dental plaque and all other deposits, followed by polishing the teeth. Oral prophylaxis is accompanied by oral hygiene instruction and dental health education. At the time of prophylaxis treatment, the Navy's three-agent stannous fluoride program may be accomplished.(*25*) Topical fluoride preparations in the forms of a polishing paste and a 10 percent stannous fluoride solution are applied to the teeth. Use of a fluoride dentifrice during personal hygiene is recommended as the third agent. Fluorides in paste solutions or gels and dentifrices are also accepted topical fluoride agents.(*26*)

Fluoridated drinking water is an effective communal method for providing protection against dental caries for large populations.(*25*) The addition of fluoride to drinking water is justified because it is incorporated into the enamel crystals during tooth formation, rendering teeth resistant to caries.(*26*) There is also a reduction in new cavities by topically applied fluoride which may not be solely dependent upon enamel incorporation. An additional preventive mechanism of topical fluorides appears to be a direct antibacterial action.(*27*)

Personal care procedures for plaque control still begin with a regular practice of toothbrushing with an approved fluoride dentrifrice. Thoroughness with which one brushes is more important than specific techniques or brush type. Since interproximal plaque cannot be removed by brushing, the use of dental floss or

toothpicks goes hand-in-hand with the use of the toothbrush. Reports have recently indicated an added value of daily or weekly use of fluoride rinses and gels as an important part of personal care. (*28,29*)

Finally, the role of the diet in the control of plaque and dental caries can be outlined by three approaches. (*30*) In general, a diet which is adequate for the overall health of the individual is adequate for dental health. Second, one should reduce the intake of fermentable carbohydrates, particularly sucrose. And, third, the ingestion of fluoride, preferably through the drinking water, or by approved supplementary fluoride compounds during tooth-formation years is highly recommended.

Continued research in the development of methods to control or eradicate *S. mutans* and the application of promising results should, in time, control dental caries. The Naval Dental Research Institute, Great Lakes, continues to work in evaluating methods to control or eradicate *Streptococcus mutans* as the principle etiologic agent associated with dental caries. Our goal is that Navy and Marine Corps personnel can be maintained in a satisfactory state of oral health. These health benefits can be realized from early diagnosis of incipient lesions at the reversible stage and from rational, highly effective, and personally acceptable preventive measures. As a result, it is hoped that the Navy's mission will no longer be compromised by acute oral disease episodes.

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BUMED SITREP

LEGISLATIVE ACTION

Before adjourning the 1st session of the 96th Congress, the Senate acted on four legislative items of interest to the Navy Medical Department.

• **Special Pays.** The Senate passed an amended version of professional special pay bill, H.R. 5235. (The House passed the original bill in November 1979). The pay measure now moves to a House-Senate Conference, tentatively scheduled for 23 January 1980, for resolution of differences. DOD has already begun action to speed implementation of the anticipated new pay system.

• **Civilian Physician Comparability Allowances.** The Senate cleared for Presidential signature, H.R. 5015, an Act extending the Comparability Allowance Program for two years. With this extension, service agreements may be offered to eligible civilian physicians until 31 Sept 1981. A BUMED instruction on implementation of this program will be published.

• **Champus Eligibility for Veterans with Service-Connected Disabilities.** H.R. 5025, passed by the Senate, was cleared for Presidential action. This bill provides that a CHAMPUS-eligible veteran with a service-connected disability may not be denied care and treatment for such disability under CHAMPUS solely because the veteran is eligible for such care in Veterans Administration facilities.

• **Extension of the Tax Moratorium on AFHPSP Benefits.** The Senate cleared for Presidential signature a bill to continue the temporary tax moratorium for Armed Forces Health Professions Scholarship Program benefits. Under H.R. 5224, the Moratorium will extend to cover all students entering the program during calendar year 1980.

MEDICAL EFFECTS OF NUCLEAR WEAPONS

The Armed Forces Radiological Research Institute will present a course in Medical Effects of Nuclear Weapons 5-9 May 1980. Students should be physicians or Medical Department personnel who would possibly be associated with radiation injuries. Funding will be provided by HSETC. Commands should submit nominations to Bureau of Medicine and Surgery (MED 21), Washington, D.C. 20372, no later than 31 March 1980. Commands will be required to submit certification of SECRET or higher clearance in writing to Director, AFRRI, NNMC, Bldg. 42, Attn: Security, Bethesda, Md. 20014, for all selectees. Nominations should include name, rank/designator, Social Security Number, security clearance (Secret required), office telephone (autovon and commercial), and address for correspondence including office code numbers, P.O. Box, etc.

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Several activities have reported that they are not receiving copies of *U.S. Navy Medicine* on a timely basis. Some problems originate at the Naval Publications and Forms Center, Philadelphia, the central distributer. That situation is now being corrected. To insure delivery locally, commanders are urged to monitor their activity's mailrooms. *U.S. Navy Medicine* is to be distributed, one copy for each Medical, Dental, Medical Service, and Nurse Corps officer and one copy for every 10 enlisted Medical Department members. For BUMED to determine the efficacy of new controls and distribution from Philadelphia, each activity should notify via phone or letter BUMED (MED 001D) upon receipt of the March and April issues. Autovon 294-4253.

PRECIOUS METALS

The recent dramatic increase in the cost of gold and silver requires increased emphasis on the part of dental officers having custody of materials containing these metals to insure adequate security measures for storage and distribution of these materials. Attention is also directed to BUMEDINST 4010.2, which outlines the Department of Defense Precious Metals Recovery Program. All dental officers are reminded of the need to use materials containing precious metals judiciously, avoiding waste.

MEDICO-LEGAL FEEDBACK: HOLD-HARMLESS AGREEMENTS

Memoranda of understanding and support agreements sometimes reach BUMED with language that purports to relieve the other party of liability or reimburse him in the future if liability accrues. This kind of language is known in the law as a "hold-harmless" agreement, and is prohibited in the Federal Government unless specifically authorized by Congress.

Title 31, U.S. Code, section 665(a) provides that no employee of the U.S. can expend money in excess of the amount appropriated or obligate the Government to pay money in advance of appropriations made for the particular purpose, unless specifically authorized by law. This section has been interpreted to prohibit hold-harmless agreements on the ground that they would constitute the obligation of funds not yet appropriated.

*U.S. GOVERNMENT PRINTING OFFICE: 1980:311-475/12

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